

Buyer's Guide to C64 Chess

July/August 1986

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Commodore

microcomputers

C64 Body Language

**Health and Fitness
with Your Computer**

**Preview:
Amiga
Music
Studio**



**How to Design Games,
Part 3**

Software Reviews:

Word Writer 128

Pocket Planner

Touchdown Football

Personal Portfolio Manager

Kung Fu

Fontmaster VI

Free Programs:

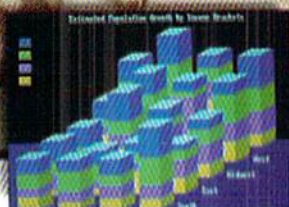
128 Disk Editor

Equestrian 64

Typewriter 64



YOU'VE ALWAYS HAD NOW YOU CAN HAVE AN



Amiga's 4,096 colors give
your business graphics a
visible advantage.

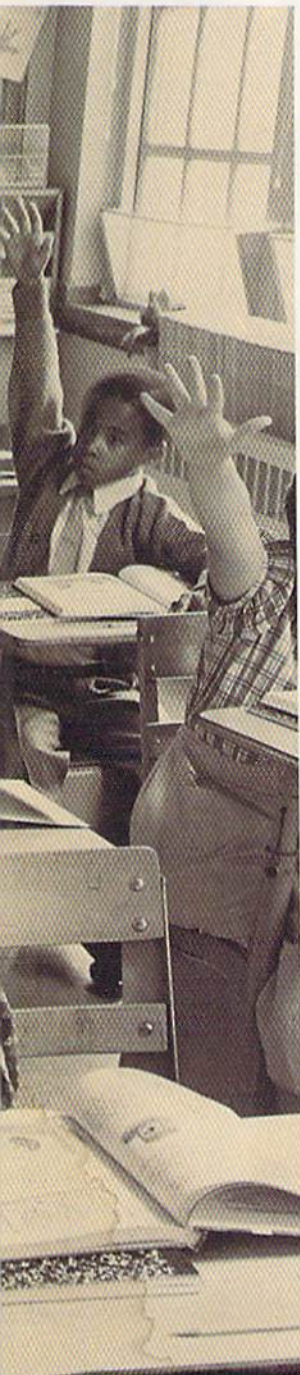


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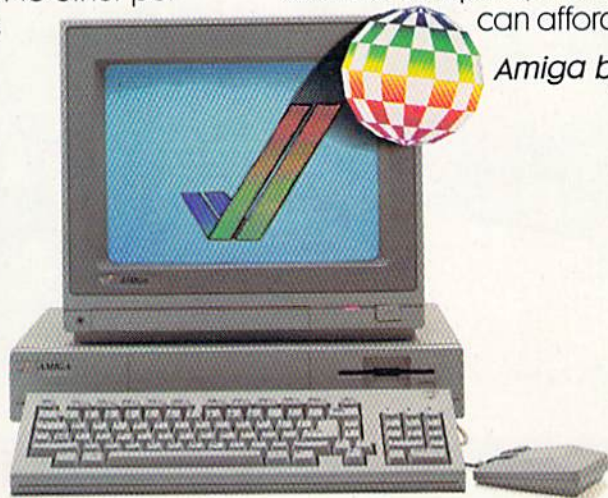
Amiga is IBM-compatible, too. A simple piece of software teaches Amiga to emulate the IBM operating system, so you can run most IBM programs. You'll have instant access to the largest library of business software in the world, including favorites like Lotus® 1,2,3 and dBase®.

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microcomputers

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- Page numbering in decimal or Roman
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- Form-letter / data merging
- Reads and writes either PRG or SEQ text files
- Help screens
- Right-to-left editing features for foreign languages (Hebrew, Arabic, etc.)

Word Processing Printing Features

- 47 two-letter format controls (embedded in text files)
- Fractional-character spacing used on word-wrap, justification, centering, and right alignment
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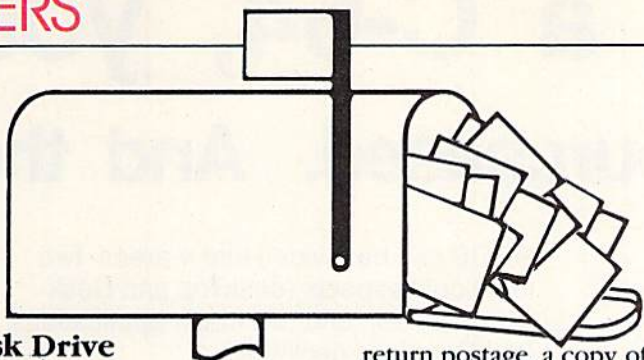
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LETTERS



MSD Disk Drive

To the Editor:

Now that Micro Systems Development, maker of the MSD disk drive, is no longer in business, an information exchange is being set up to serve the needs of MSD disk drive users. The first project is a data base of compatible software. Users of MSD disk drives are encouraged to participate.

The MSD Information Exchange is a no-fee non-profit service. Those who contribute information to the exchange will be provided the following services.

- For a self-addressed, stamped envelope, a printout of available information in a selected category.
- For a blank disk, with mailer and

return postage, a copy of the Information Exchange data disk in *Superbase 64* format (data disk only).

The information exchange will also maintain files on the availability of technical information on MSD disk drives, including parts, service, service or maintenance manuals, wiring diagrams, and memory maps.

Paul E. Eckler

MSD Information Exchange

2705 Hulman Street

Terre Haute, IN 47803

Directory Alphabetizer II

To the Editor:

The "Directory Alphabetizer II" program by Louis F. Sander in the March/April, 1986, issue accom-

plished the kind of directory listing I had been wanting.

However, like many other readers of your magazine, I don't have a 1526 or MPS-802 printer—I have an Epson FX-80. Consequently, since I wanted to use Mr. Sander's program, it was necessary to modify it for my printer. I also use two 1541 disk drives, and to address either drive required a minor modification. Another small change allows the user to print the directory of subsequent disks without having to reload the program.

To adapt "Directory Alphabetizer II" to Epson-type printers, the program lines in Listing 1 must be substituted for the original lines. In addition, the lines in Listing 2 must be added to the program.

Please note that these modifications permit the user of either disk drive #8 or #9 and provide for printing the directory of a new disk without reloading the program.

Listings on page 8

William H. Price

Riverside, California

Continued on pg. 8

Have your C-128* look as smart as it works...

with the **Command Center**, a space saving cabinet specially designed for the C-128 Personal Computer System. Just install your keyboard and disk drives, set your CRT on top, and you've got Commodore value with the look of a much more expensive system.

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The Command Center consolidates all these peripherals.



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DEALER INQUIRIES INVITED

If you own a C-64, you

The one you purchased. And the



GEOS realizes the technical potential that has been in the C-64 all along. Speed. Power. Ease of use. Sophistication. Elegant, practical applications you might expect of a high-end personal computer, all made possible with GEOS. It's so simple—but then, so was fire. Once it caught on.

To begin at the beginning. **GEOS** stands for **GRAPHIC ENVIRONMENT OPERATING SYSTEM**. Why?

GRAPHIC: Because menus and icons replace long, typed command lines. Point and click, that's it.

ENVIRONMENT: Because GEOS provides a consistent, powerful way to use your computer. Learning new applications is a snap (or should we say click).

OPERATING SYSTEM: Because GEOS orchestrates every function so that they all work together systematically, even symphonically.

Some basics. Icons are graphic images which represent files or utilities. Each is different, and all are easy to recognize and easy to use.

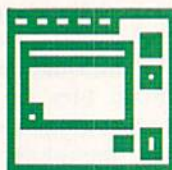
A menu is just that: a list of functions available for selection. When a menu appears, move the pointer to any item you wish. Click. Click. You're on your way.

A pointer is used to select and activate items. To move the pointer, roll the mouse or trackball or rotate the joystick. Once on target, click once to select; click a second time to activate.

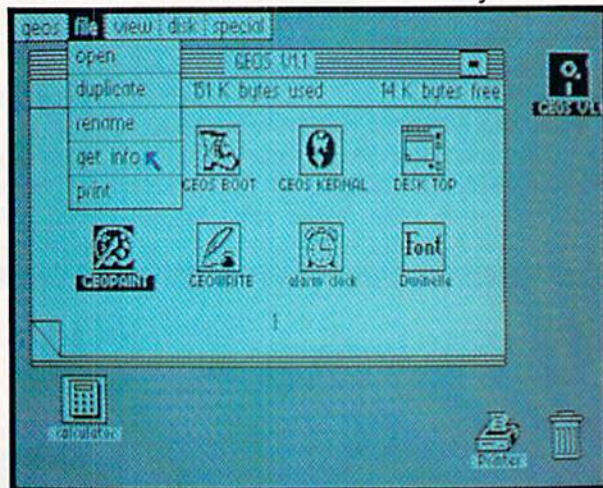
Fonts are a new way of looking at text. Choose from 5 different fonts (with more on the way). Try *Dynalene*, or Roma, **bold**, or *italics*, even underline and outline. Need to fit more words on a line? Pick a smaller point size, like University 6 point, and get over one hundred characters per line.

All this and fast too. Because the integrated diskTurbo software improves 1541 disk drive performance 5 to 7 times. That's right. On both reads and writes.

GEOS can be divided into 4 areas: two functional aspects (deskTop and Desk Accessories), and two major applications (geoPaint and geoWrite).



deskTop. deskTop is a graphic interface, making file organization and management easy. As always, you call the shots. Load a disk. Files appear as icons on the disk notepad; to flip through, point at the folded corner and click. Prefer a file appear on a different sheet? Move it. It's easy.



Create a new document or re-name an existing one. Want to copy a file onto the same or a different disk? Fine. Forgotten what a file contains? Select "get info" from the file menu. A description of that file's contents appears. Finished with a file? Print it. Save it. Or drop it in the trash and have done with it. Your call.

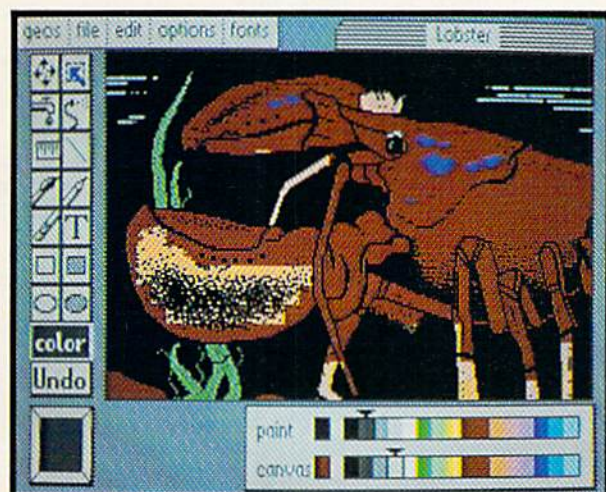


geoPaint. A full-featured, color graphics workshop at your fingertips. The pointer operates any one of the fourteen graphic tools and shapes in the drawing menu.

Create masterpieces on the Drawing Window. By turns, use a pencil, an airbrush or a paint brush, each with a character all its own. Draw straight lines, squares, rectangles or circles. Fill in with any of the 32 patterns. Switch to pixel-mode, where each dot in a selected section is magnified many times its size for easy manipulation.

own two Machines.

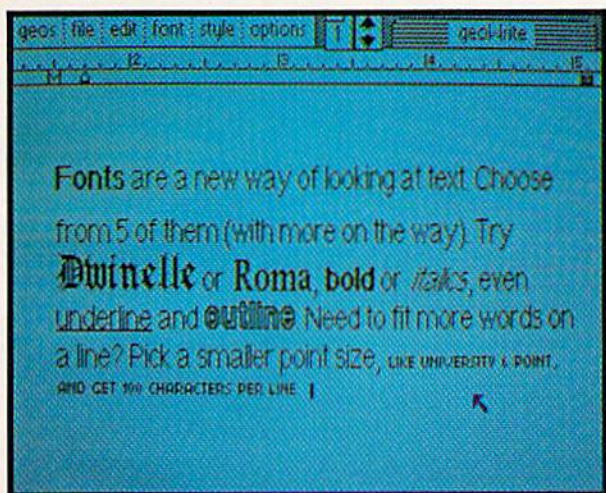
personal computer GEOS™ unlocks.



Second thoughts? Erase what you don't want. Or "UNDO" your last act. (If only life could imitate art!)

Add text if you like, in different fonts, styles or point sizes. Even change its position or layout at will.

Move or copy any part of your creation. Once done, you can include your artwork in another document—a letter home perhaps. (Won't Mother be pleased?) GEOS makes it easy.

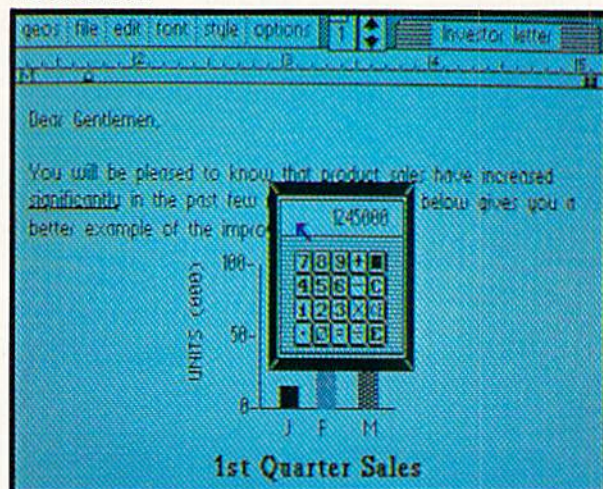


geoWrite. An easy to use, "what you see is what you get" word processor. Create documents. Insert, copy, move or delete text as you wish. Choose from 5 different

fonts in many different styles and point sizes. Preview your page exactly as it will

appear off the printer. Typists will appreciate tabs, word-wrap and page breaks.

Documents may contain up to 64 pages. What's more, you can move to any page instantly. If you like, you can cut selected text from one section and move or copy it to another. Add graphics from geoPaint. It's a cinch.



Desk Accessories. Handy programs you can use while in any GEOS application. These include an alarm clock, a notepad for reminders, a four-function calculator, and photo and text albums which store pictures and phrases you may then paste into applications. The Preference Manager even lets you establish parameters for everything from mouse speed to the date and time—even background color. Civilized options, every one.

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GEOS Diskette includes deskTop, diskTurbo, geoPaint, geoWrite and desk Accessories \$59.95.
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LETTERS

Ode to Computer Equipment Designers

To the Editor:

Computer gear is really neat.
Some of it just can't be beat.
We've come so far since ENIAC
And I, for one, would not go back.

But in these miracles emerging fast
There lurks a relic from the past
That makes me wonder if these tools
Were actually designed by fools!

I refer to the danger to my wrist
When behind the disk drive it bends and twists
Hoping to find the switch so small
Which hides between machine and wall.

Or when my back and neck do twitch
Trying to find the printer switch.
What a shame the equipment stack
Has all its buttons on the back!

It only takes two strips of wire
To move the switch where I desire.
I'd pay the extra dime or two
To have the power switch in view.

You'd think an auto maker drunk
If your car ignition were in the trunk.
An architect would be a goof
If the front door lock was on the roof!



Chat with your friends on your Commodore® computer free.

Talk isn't cheap, it's free for one hour. Sign up now for QuantumLink™, the new telecommunications service for Commodore 64® and Commodore 128™ computers, and with your free hour get a free month of fun and information when you pay for one month of service (\$9.95).

You must have a modem and disk drive to use QuantumLink. If you don't have a modem, pick one up at a retail outlet. Then hook up your modem and call QuantumLink on your computer (not your telephone).

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Stephen S. Leven
Randallstown, Maryland

Commodore Microcomputers welcomes letters from readers. Please send them to:

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West Chester, PA 19380
Attn: Letters

C

Listing 1. Substitute Lines

```
610 REM ****EPSON-TYPE PRINTER
    ENHANCEMENT
730 PRINT"[CLEAR]":INPUT"[DOWN]
    WHAT IS THE DRIVE # TO PRINT";DN
920 IF BB<>1 THEN GOSUB 160
    :REM READ DIRECTORY
930 FS(0)=MID$(FS(0),2,
    21)+" "+CHR$(13):A=0
1100 INPUT"[DOWN]ANOTHER DISK (Y OR
    N) [SPACE2]Y[LEFT3]";B$
    :B$=LEFT$(B$,1)
1110 END
1230 PRINT"[DOWN2,SPACE5]
    ALIGN TOP OF PAPER FOR PRINTING,"
1240 PRINT"[SPACE2]THEN PRESS A
    KEY...":GOSUB 1610
1250 OPEN 4,PN,0
1260 J=22:K=72:L=36:C$=BF$
    :IF OD$="DIRECTORYRY7:K=50:L=25
    :GOTO1280
1270 PRINT#4:U$="[DOWN]-MORE-[UP]"
    :REM SKIP
1280 PRINT#4,CHR$(27);"0"
    :REM SET LINES PER INCH
1310 PRINT SPC(23)"("MID$(STR$(N),
    2)"[SPACE2]"B$CHR$(14);
    :REM #FILES & COMMENT
1480 IF K=50 THEN FOR I=1 TO 80-M
    :PRINT:NEXT:REM FORM FEED FOR
    NOTEBOOK
1490 IF K=72 THEN FOR I=1 TO
    78-M+5*(N>48)+(N=72):PRINT:NEXT
    :REM PAGE
1500 BF$=C$:U$="":PRINT#4:CLOSE 4
    :REM RESET
```

END

Listing 2. Additional Lines

```
120 CLR:GOTO 700
925 IF BB=1 THEN GOSUB 170
1102 IF B$<>"Y"AND B$<>"N"THEN 1100
1104 IF B$="N"THEN 1110
1106 IF B$="Y"THEN BB=1:CLR:GOTO
1285 PRINT#4,FS(0)
```

END

Solutions!



**Pocket
Writer 64**
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PW 128/64 Dictionary
also available at \$14.95 (U.S.)



**Pocket
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**Pocket
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Spread Sheet



**Pocket
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Database



**Pocket
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Database

Only The Name Is New

The professional, full-featured software line from Digital Solutions is now called Pocket Software.

Pocket Writer 128/64.

Pocket Filer 128/64.

Pocket Planner 128/64.

The names are new, but this super software is still the same.

From now on, when you hear the word Pocket, it means software that's full-featured, handy and easy to use.

Pocket Software at prices that won't pick your pocket.



**Pocket
Planner 128**
Spread Sheet

Best-selling software for Your Commodore 128 or 64

You want the very best software you can find for your Commodore 128 or 64, right?

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With Pocket 128 or 64, you'll find all the features you can imagine... and then some. And Pocket 128/64 is so easy to use, you won't even need the reference guide. On-screen and in memory instructions will have you up and running in less than 30 minutes, even if you've never used a computer before.

The price? It's as low as you'd expect for a line of software called 'Pocket'. Suggested Retail Price for the 64 software is \$39.95 (U.S.) and \$49.95 (U.S.) for the 128. Any of the 64 products may be upgraded to their 128 version for \$15.00 (U.S.) + \$3.00 shipping and handling. (Available to registered owners from Digital Solutions Inc. only.)

Pocket Writer 128 or 64, Pocket Planner 128 or 64 and Pocket Filer 128 or 64... **Solutions** at sensible prices from Digital Solutions Inc.

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that's simple to use.**

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Animated Electronic Greetings

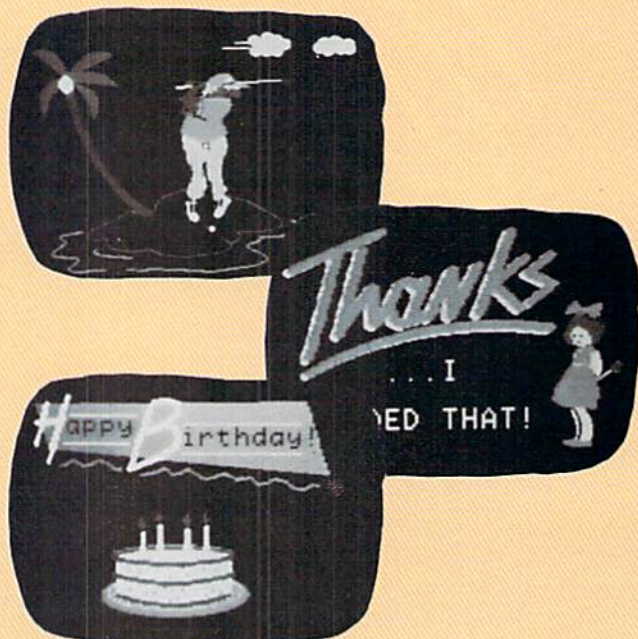
CompuServe subscribers can now create and send electronic greetings—complete with animation and sound effects—with **Color Mail** software from Hallmark Cards.

Color Mail combines a variety of special effects, including graphics, animation, music and sound effects, into personalized greetings. In addition, the user can add typed messages and tint the screen with 16 colors.

To use **Color Mail**, network subscribers create their greetings off-line with the software and send the messages via CompuServe's electronic mail. Recipients then electronically transfer the greetings for viewing off-line using their **Color Mail** disks. **Color Mail** is available to CompuServe subscribers with Commodore 64's or 128's.

The **Color Mail** software may be ordered from CompuServe for \$40, which also includes CompuServe's Vindex communications program, 103 design elements and illustrated user guides. To send a greeting, **Color Mail** users pay 25 cents in addition to the regular CompuServe connect-time charge.

New groups of design elements called libraries can be ordered and downloaded electronically. In addition, Hallmark Cards is



sponsoring a special exchange forum on CompuServe so **Color Mail** users can exchange ideas and ask the developers of **Color Mail** questions. (Hallmark Cards, 2440 Pershing Road, Suite G-40, Kansas City, MO 64108)



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Libya Air Strike Update

MicroProse has updated their **F-15 Strike Eagle** documentation to include some of the key events in the April 14th U.S. air strike against Libya. Updated versions, shipped in late May, are now available in stores.

The update provides background information and an updated map, along with suggestions on how to use various parts of the program's seven missions. Owners of the original version may obtain updated documentation from their software dealers. The software program itself remains unchanged. (MicroProse, 120 Lakefront Drive, Hunt Valley, MD 21030)

Saxophone Master

MasterSoft has released another program in the Mastery in Music Band Series. **Saxophone Master** joins **Flute**, **Clarinet** and **Trumpet** in offering an alternative to drill and practice with music personalized by your choice of key signature, time signature, note type and note range. Change tempos and play along with instant access to music facts and fingerings. Exercises encourage beginners and challenge professionals. Also includes scales, thirds and intervals in all major keys. Make hardcopy references with the special printer option. Available for the Commodore 64/128, it retails for \$49.95. (MasterSoft, P.O. Box 1027, Bend, OR 97709)

Power—you know you love it.

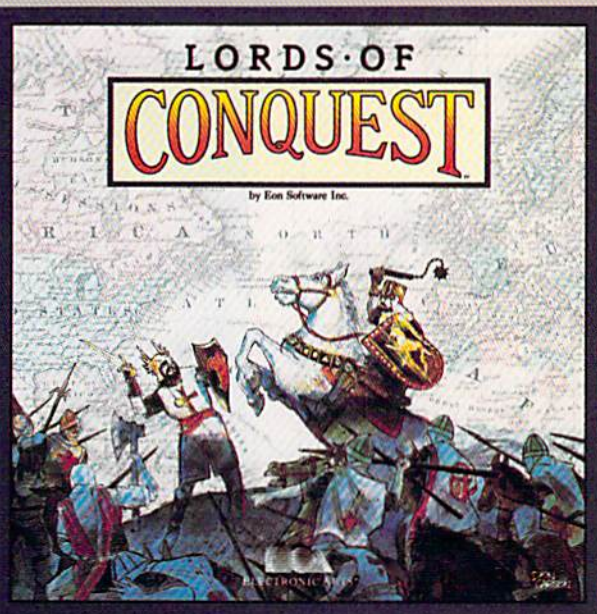
You used to play RISK as a kid. Maybe you still do sometimes — whenever you can get enough people together.

Did you ever wish you could play by yourself? Or make changes in the map? Wouldn't it be great if you could attack North Africa from North America? Or Japan from Brazil?

Announcing Lords of Conquest™ from Electronic Arts.

It isn't RISK... it's better.

It's a conquer-the-world board game that explodes with new life and new possibilities because it uses all the power of your computer. Every battle is alive with



music, color graphics, and strategic challenges impossible in a board game.

Imagine...

...having an infinite number of unique maps to choose from, so each game is different.

...marching your armies

onto warships for attacks across oceans.

...great multi-player games, complete with treaties, trades, and treachery.

...playing challenging solo games against an intelligent computer opponent.

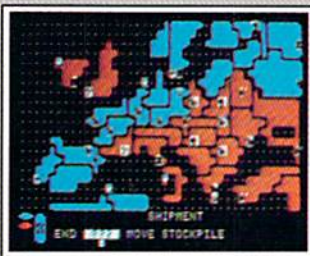
...a built-in game editor powerful enough to be called a "Strategy Game Construction Set."

Lords of Conquest. No more mucking around with cards and dice and little pieces of plastic that roll under the couch. Now you're free to concentrate on more important things. Like exterminating the opposition.



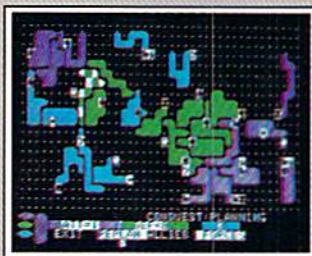
A Great Strategy Game

- Five kinds of forces to fight with — horses, weapons, boats, territory positions, and cities.
- Five kinds of wealth to fight for — gold, timber, iron, coal, and herds of horses.
- For 1-4 players. As fun for one as it is for four.



New Worlds to Conquer

- An infinite variety of game maps.
- Create your own, or play any of 20 built-in maps like Ancient Rome, European Wars, and The World.
- The computer can generate unlimited random maps.



Strategy Game Construction Set

- Variable game settings — you set the locations and abundance of resources, forces, and transport.
- You decide the luck factor.
- 4 levels of complexity.
- 9 levels of handicapping.



ELECTRONIC ARTS™

How to order: Visit your retailer. If you are unable to find the product at your local retailer, you can call 800-245-4525 for direct VISA or Mastercard orders (in CA call 800-562-1112). The direct price is \$32.95 for the Commodore version. Apple and Atari versions coming soon. To buy by mail, send check or money order to Electronic Arts Direct Sales, P.O. Box 7530, San Mateo, CA 94403. Add \$5 for shipping and handling (\$7 Canadian). Allow 4 weeks for delivery. There is a 14-day, money-back guarantee on direct orders. For a complete product catalog, send 50¢ and a stamped, self-addressed envelope to Electronic Arts Catalog, 1820 Gateway Drive, San Mateo, CA 94404. RISK is a registered trademark of Parker Brothers Co. Commodore is a registered trademark of Commodore Business Machines. Apple is a registered trademark of Apple computers. Atari is a registered trademark of Atari. Borderlands and Cosmic Encounter are registered trademarks of EON Software. Lords of Conquest and Electronic Arts are registered trademarks of Electronic Arts.

Lords of Conquest is based on the board game "Borderlands"™ by EON — the creators of "Cosmic Encounter"™

Centronics Printer Network

Comspec Communications has released the Microshare MCS 8000, a printer network incorporating an internal 256K buffer. This network is for any computer using a standard Centronics output to the printer.

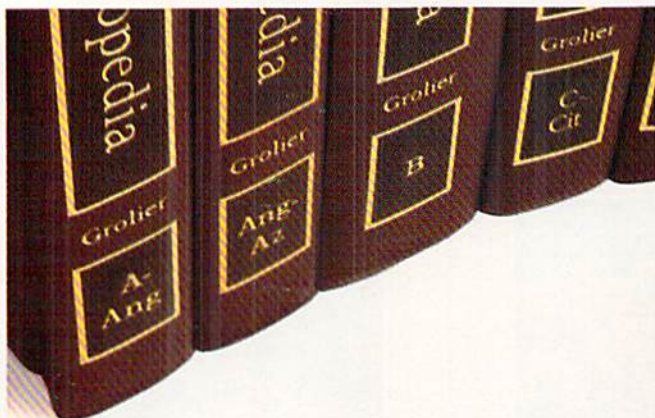
With the MCS 8000, you can connect several computers to one printer. Because the MCS 8000 has a built-in 256K buffer, it is able to accept requests for printing from more than one computer at the same time.

The MCS 8000 is available in either a four-channel (MCS 8004) or eight-channel (MCS 8008) configuration. By cascading the networks, it is possible to add an infinite number of computers. It is completely software transparent and does not require any special commands or environments to operate. It connects to the Centronics printer output port and requires no modifications to the computer or additional hardware to be installed. The MCS 8000 network is self-contained and doesn't require any memory in the computer.

The MCS 8000 comes complete with all necessary cables and connectors. When ordering, please specify the type of cables you



require. The MCS 8004 retails for \$742, and the MCS 8008 retails for \$866. (Comspec Communications, 153 Bridgeland Avenue, Unit 5, Toronto, Ontario, M6A 2Y6, Canada)



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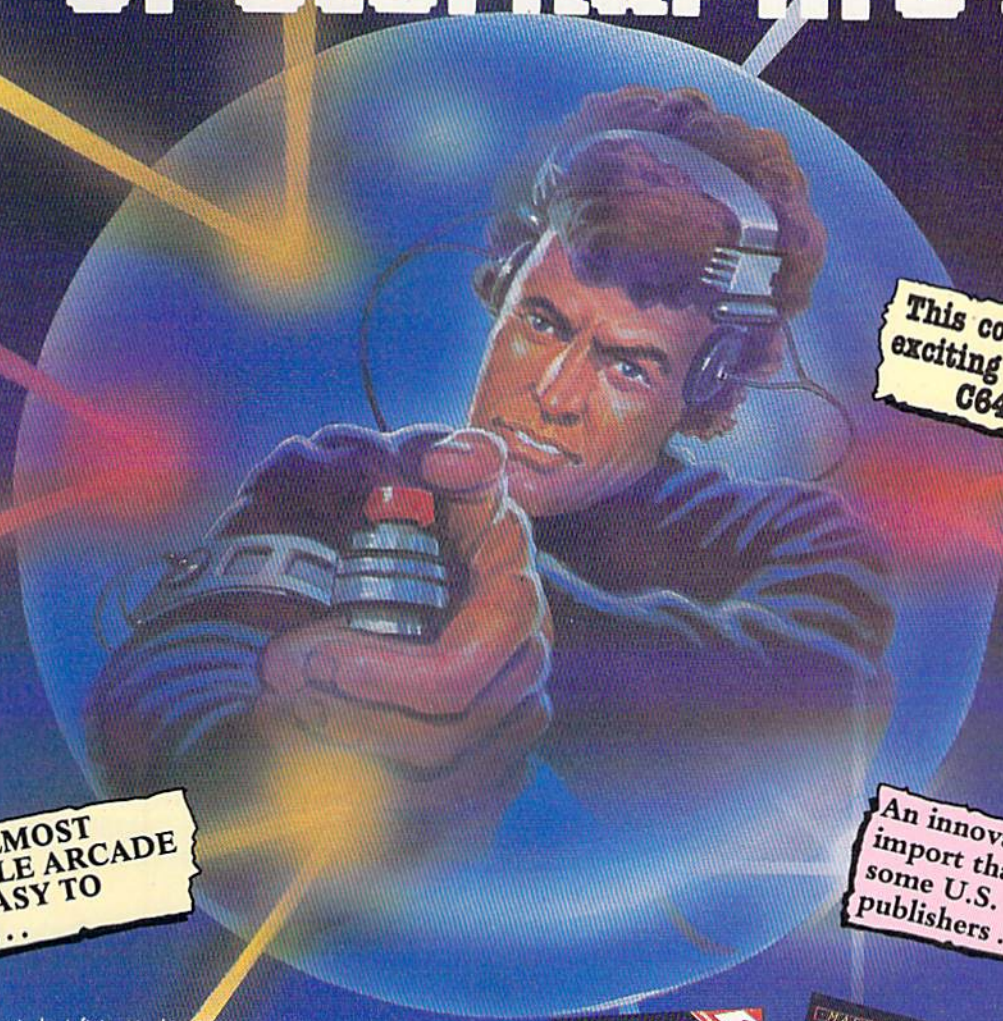


End of the Plain Mouse

MouseTop, the mouse cover with a "country mouse" look, gives personality to the Amiga and Commodore 128 mice. Made from silver/gray fur, MouseTop comes in two varieties. One is slightly near-sighted and wears wire-rimmed glasses, and the other has perfect vision.

The washable MouseTop protects the mouse from the grime of daily use, and its humorous appearance can weasel a smile out of the most serious hacker. MouseTop retails for \$5.95 with glasses and \$5.49 without. (H & H Enterprises, Box 2672, Corona, CA 91718)

The Infinity Machine holds the secret of eternal life!



This could be the most exciting product for the C64 in 1986!

MAKES ALMOST IMPOSSIBLE ARCADE GAMES EASY TO MASTER...

An innovative 'hi tech' import that will shock some U.S. software publishers...

Q: What is the Infinity Machine?

A: A unique and revolutionary accessory for the Commodore 64 and 128. This powerful cartridge now lets you effortlessly play all those impossible games without being killed!

Q: Sounds difficult.

A: It's Simple - Just plug into your C64/128 and press a button to activate the Infinity Shield.

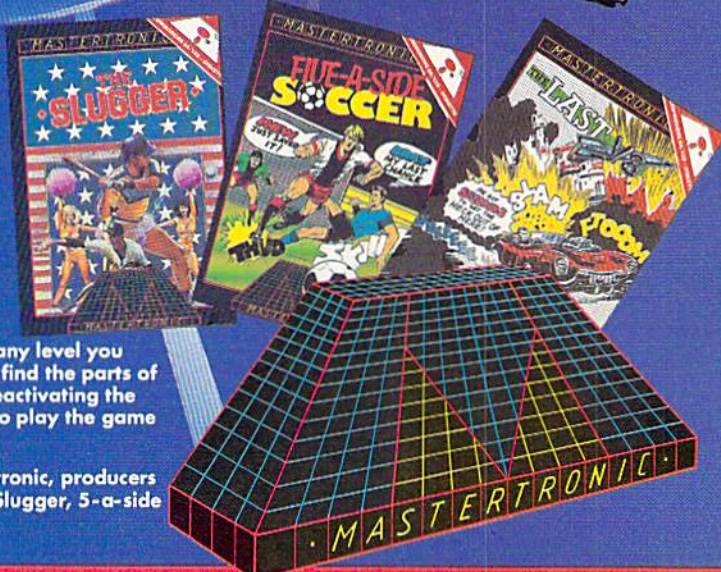
Q: How does it work?

A: All the thousands of published action and animated games that use a programming device called "Sprite collision detection", are disabled by the Infinity Machine and the Infinity Shield protects the player from being shot or crashing!

Q: What can I now do in a game that I couldn't before?

A: Activating the cartridge enables you to: "Enter a game at any level you choose". "Explore all the areas and levels of the game and find the parts of the game you didn't know existed without being killed." Deactivating the cartridge at any point you choose enables you to continue to play the game totally normally.

The Infinity Machine is brought to you at \$24.99 by Mastertronic, producers of incredible value Commodore 64/128 K software such as Slugger, 5-a-side Soccer and The Last V8 all available at \$9.99.



Contact the Mastertronic hot line for the secret of eternal life on 301-695 8877.
Mastertronic International Inc., 7311b Grove Road, Frederick, Maryland 21701

New Products on QuantumLink

A new area of the QuantumLink telecommunications service has been created for companies to announce new products for Commodore computers. Companies post product information directly on the special electronic message board, with all information made available to users within 48 hours after it's received.

The New Product Information message board is currently located within Robert W. Baker's Meet the Press section of the Commodore Information Network on QuantumLink. For information on QuantumLink's complete telecommunications services, call 800-392-8200.

Mental Fitness on the Commodore 64

Electronic Arts has released **Mind Mirror**, a mental awareness program for the Commodore 64 by Dr. Timothy Leary. Part game, part tool and part philosopher-on-disk, **Mind Mirror** is a trip through inner space. After selecting a subject (or stereotype) to scrutinize, the user rates the subject on a series of seven-point scales. The program then summarizes the results and presents them in the form of a Mind Map, a geographical representation that allows direct comparison between different subjects.

You are then invited to play Life Simulations, the part of the program where you really give your subject the test. Life Simulations presents you with a series of situations, and asks you to respond to each one through the eyes of your subject. (Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404)

Special Education and Rehabilitation Source

Closing the Gap has announced the availability of the **1986 Resource Directory**, a comprehensive resource guide to the organizations and companies whose services and products are applicable for use in special education and rehabilitation. The 128-page guide provides information on what's available and where to find it. It is divided into four sections: organizations, publications, software and hardware.

The **1986 Resource Directory** provides a sampling of the information contained in Closing the Gap's data retrieval service, CTG Solutions, the source for information on all products and applications of computer technology identified by Closing the Gap during the past five years. It retails for \$7.95 (discounts for bulk). (Closing the Gap, P.O. Box 68, Henderson, MN 56044)

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With QuantumLink™ the new telecommunications service for Commodore 64® and Commodore 128™ computers, you can sample the latest software free for one hour. Now sample QuantumLink's other services free, too. A month of news, fun and information is free when you pay for one month (\$9.95).

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Murder Mystery for the Commodore 64/128

Activision has released **Murder on the Mississippi**, a 19th-century murder mystery set on a Mississippi riverboat. The company has also announced the national **Murder on the Mississippi** contest, whose winner will receive a trip for two down the Mississippi River.

Murder on the Mississippi takes you on the Delta Princess riverboat in search of a murderer. Sir Charles Foxworth, a famous British sleuth, and his constant companion, Regis Phelps, have discovered a body, and you must help them search for clues and suspects.

Gamers may qualify themselves and the retail outlet from which they purchased **Murder on the Mississippi** when they fill out a contest entry form and send it to Activision. Details of the contest will be available inside specially marked boxes of **Murder on the Mississippi** and at participating retail outlets. The program retails for \$34.95. (Activision, 2350 Bayshore Frontage Road, Mountain View, CA 94043)



Flight Simulator II Scenery Disks

The Challenge of Accomplished Flight

With a realism comparable to (and in some ways even surpassing) \$100,000 aircraft flight simulators, Flight Simulator II includes full flight instrumentation and avionics, and provides a full-color out-the-window view. Instruments are arranged in the format standard to modern aircraft. All the radios needed for IFR flight are included. Front, rear, left, right, and diagonal views let you look in any direction. Program features are clearly documented in a 96-page Pilot's Operating Handbook.

For training in proper flight techniques, Flight Simulator II includes another 96-page instruction manual, compiled by two professional flight instructors with over 8,000 hours flight time and 12,000 hours of aviation teaching experience. You'll learn correct FAA-recommended flight procedures, from basic aircraft control through instrument approaches. To reward your accomplishments, the manual even includes a section on aerobatic maneuvers.

The Realism and Beauty of Flight

Go sight-seeing over detailed, realistic United States scenery. High-speed graphic drivers provide an animated out-the-window view in either day, dusk, or night flying modes.

Flight Simulator II features over 80 airports in four different scenery areas: New York, Chicago, Seattle, and Los Angeles. Six additional Scenery Disks covering the entire Western half of the United States are now available in IBM and C64/128 disk formats.

Apple and Atari versions will be released soon. Each disk covers a geographical region of the country in detail, and is very reasonably priced.

The Pure Fun of "World War I Ace"

When you think you're ready, you can test your flying skills with the "World War I Ace" aerial battle game. This game sends you on a bombing run over heavily-defended enemy territory. Six enemy fighters will attempt to engage you in combat as soon as war is declared. Your aircraft can carry five bombs, and your machine guns are loaded with 100 rounds of ammunition.

See Your Dealer. Flight Simulator II is available on disk for the Apple II, Atari XL/XE, and Commodore 64/128 computers for \$49.95. Scenery Disks for the C64 and IBM PC (Jet or Microsoft Flight Simulator) are \$19.95 each. A complete Western U.S. Scenery six-disk set is also available for \$99.95. For additional product or ordering information, call (800) 637-4983.

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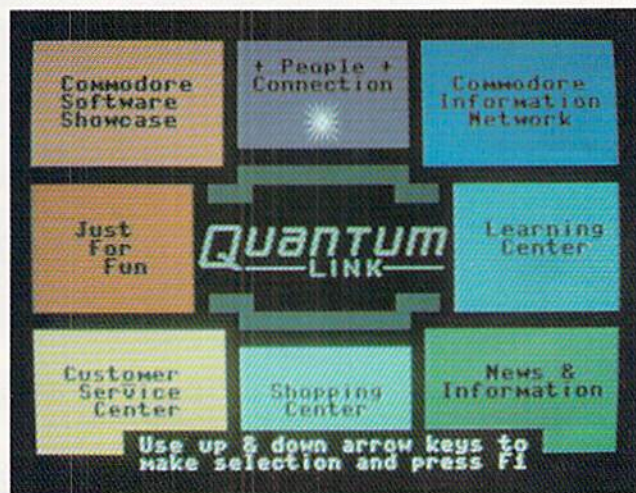
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you can expand your Commodore's universe with a whole range of QuantumLink services. And, you can access many features including the encyclopedia, software catalog, USA Today, entertainment news and trivia quizzes as often as you like, for no extra charge. Special "Plus" services cost only 6¢ per minute. *But, your first hour of "Plus" time every month is free.* (No surcharges for communications or 1200 baud access, either!)

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Now, getting on-line with QuantumLink is easier than you ever imagined. If you have a modem, we'll send you the QuantumLink telecommunications software and when you sign up for a month, we will give you the

If you don't have a modem:



When you sign up for 4 months service.

second month of service *free*.

If you don't have a modem, we'll send you a 300 baud auto-dial modem and the QuantumLink software *free* when you sign up for four months.

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BY MAIL:

Mail card or this coupon to Quantum Computer Services, Inc., 8620 Westwood Center Drive, Vienna, Virginia 22180.

*If you use more than the included 1 hour of Plus services each month, you will be billed for the extra time. Offer valid in Continental U.S. for new subscribers only.

Touchdown Football

Computer: Commodore 64

Publisher: Imagic/Electronic Arts
2755 Campus Drive
San Mateo, CA 94403

Medium: Disk

Price: \$29.95

The rumors began over a year ago. Somewhere out in Softwareland, they said, was a gridiron game so good, it had to be seen to be believed. To the delight of Commodore 64 owners everywhere, Imagic's *Touchdown Football* has finally arrived, distributed by Electronic Arts. A few minutes on the field is all it takes to convince you that its reputation is well deserved.

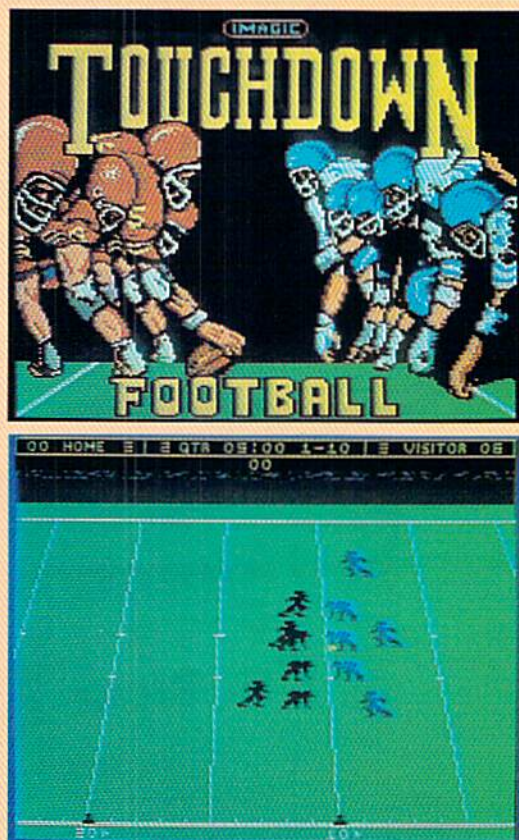
Offering five, ten and fifteen-minute quarters, *Touchdown Football* can be enjoyed as either a solitaire game against a tenacious computer opponent or by two players battling head-to-head. A third option is a demonstration mode that allows the computer to play itself. Novice players will find this last option useful for studying game play and picking up strategies before taking joystick in hand.

One of the most remarkable aspects of *Touchdown Football* is its ability to combine graphics, animation and strategic depth with smooth-as-silk joystick control. From play selection to execution, the action is fluid and fast-paced.

The representation of the football field offers an elevated sideline perspective. Although only 20 yards are visible at one time, the field scrolls in either direction, as if tracked by a mobile television camera. The scrolling, which is a bit jagged, coupled with the field's white yard lines produces a slight strobing effect. This can be disorienting at first, but is less noticeable after continued play.

Each player commands a team of six men, detailed right down to the face masks and knee pads. Diving tackles, body blocks, gang tackling and end zone victory dances highlight the action. Other nice touches include a referee who appears during

In Touchdown Football, pass completions are so easy that the pressure is placed where it belongs: on the defense.



the opening coin toss and after turnovers, as well as a team cheerleader who helps celebrate touchdowns.

Simple joystick input makes play selection a snap. While moving the joystick through its nine positions, each play is listed on-screen in a window above each team. During two-player games, you can choose your plays in private by holding down the fire button, moving the stick in the desired direction and releasing the button. A beep indicates that your selection has been entered.

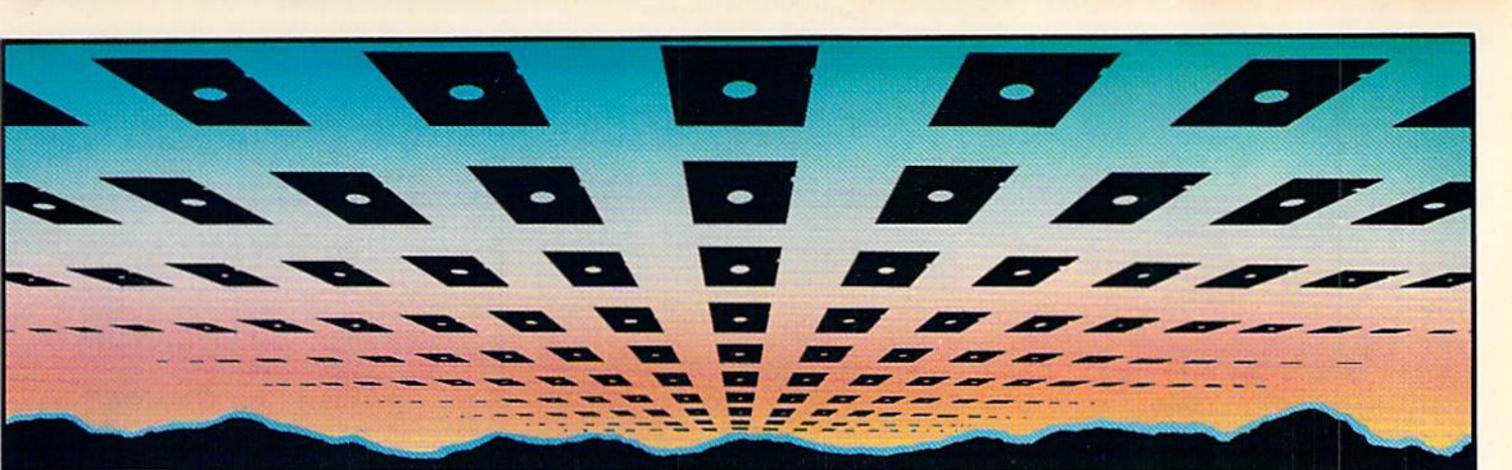
Selecting offensive plays is a three-step procedure: First you must choose from nine possible line formations, including left/right combinations of string, slot and "I" formations, split-T, shotgun and kicking setups. Next you program both left and right receivers to either block or run one of eight pass patterns (flag post, sideline, safety valve, streak and buttonhook). Finally, the offensive line must be told to block left, right or straight ahead. In addition, the kicking formation allows you to punt or attempt a field goal.

Defensive selection is less involved, requiring that you choose from nine possible formations. These include left/right combinations or prevent, tight and monster defenses, as well as the blitz, zone coverage and goal line stance. During punts, you can set up a return or try for a blocked kick. Although I've never witnessed a blocked punt, applying pressure during extra points and field goals works about half the time. Both punts and field goals can be faked. Pressing the Commodore key before the kick allows the player to run or pass.

Pressing the "T" key at the start of the game activates the 30-second clock. A five-yard penalty is assessed against the offense if time runs out. Time-outs are called by hitting the left SHIFT key for the home team or the right SHIFT key for visitors. Each team receives three time-outs per half. Pressing the spacebar pauses the game for "official" time outs.

The offensive player controls the quarterback while your opponent assumes the role of defensive free safe-

Continued on pg. 123



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TRI MICRO

P.O. Box 11300, Santa Ana, CA 92711

Personal Portfolio Manager

Computer: Commodore 64

Publisher: Abacus

P.O. Box 7211

Grand Rapids, MI 49510

Medium: Disk

Price: \$39.95

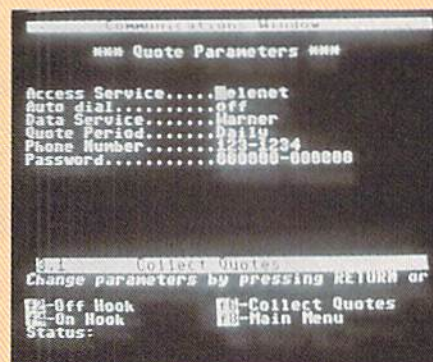
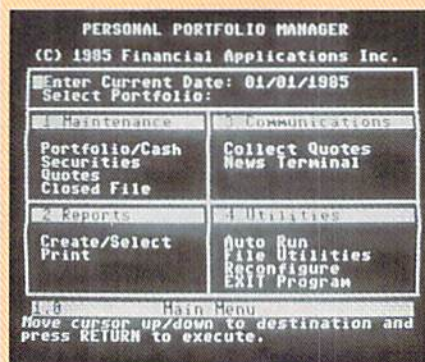
Light or heavyweight investors can use *Personal Portfolio Manager* to track stocks, bonds, mutual funds, treasury bills, or other securities. But the program does a good deal more than just store data. It performs analyses, creates standard or customized reports, and accesses commercial data bases. *Personal Portfolio Manager* has one goal: to maximize the return on your investments.

The program makes it easy to track every type of transaction, from buys and sells to short sells, covers and stock splits. Predictions of future activities (by individual security) can be plotted based on past performance and current market conditions. Plug in the data and let the 64 do the rest.

Portfolios can be created to reflect the broker, type of industry (automotive, computers, Elfin bakers), or any classification you desire. Using sophisticated features, you can even leave the 64 in auto mode and access telecommunications networks to retrieve updated quotes and output copies of reports. The package is even strong enough to be used by professionals to maintain client portfolios.

Except for the main menu, the entire program is function-key driven. Function keys and their purposes are listed at the bottom of each display screen. For example, pressing F3 on the Maintenance-to-Portfolio/Cash screen allows you to edit any field on that particular screen. On the main menu, you simply position the cursor next to the desired function and press RETURN.

Abacus warns users that some brands of equipment may not work with *Personal Portfolio Manager*. Tested hardware includes the regular 64, the SX-64, and the 128 in 64



Personal Portfolio Manager has one goal: to maximize the return on your investments.

mode. The 1541 disk drive and the following modems work: Vicmodem, 1650 and 1660. Any properly interfaced printer is supposed to work, even with the screen dump capability. (The 1526 works fine, since the screens are not bit-mapped graphics.) If you are using non-Commodore hardware, I would recommend that you test your system with the program before actually purchasing it.

A well organized user's manual is included. The first section explains how to use the manual and load the program. Instructions on making copies of the disk can also be found here. Section two is a tutorial that takes you through the main functions. Each menu option and function key is thoroughly explained, and inputs are listed so you can follow along. Everything throughout the manual is detailed and clear.

Beyond the tutorial lies the largest single part of the manual: the reference area. Each screen is displayed along with its purpose, field descriptions (where needed) and function key uses. Every aspect of the program is covered in these pages.

Finally come several appendices. Topics include the utility programs on the master disk (copy routine and two others), examples of the five standard reports (Quotes, Unrealized Gain/Loss, Income, Transactions, and Tax Report), a handy four-function

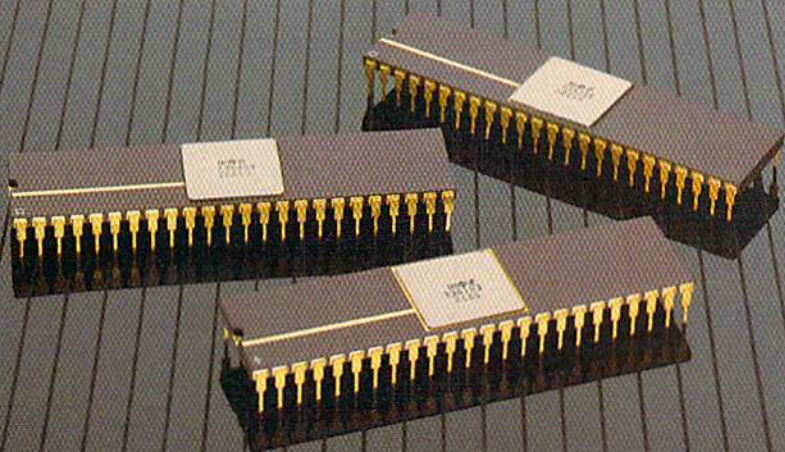
calculator, and instructions on how to manually log onto two telecommunications networks. Information about data disks and compatible products complete the appendices.

Preparing a copy of the disk takes less than ten minutes and involves two passes. The copy routine also formats the disk. The similar Reports Transfer routine (to put the reports on the data disk) needs five passes and about seven minutes to get the job done. Data disks must also be prepared. There is a 99-disk limit, so anyone handling the Getty or Gucci fortunes will have to cross this program off their list.

The main menu functions provide a good overview of the entire system. Within option one (Maintenance), you can add, edit, review or delete portfolios or cash, all types of securities, quotes (manually) or closed files. From the Reports option, you can create customized reports or select from five standard reports. Printouts can be produced at any time.

Within the Communications module, users can log onto the two networks to download information. The Utilities option includes the Auto Run program, various file utilities (to reset data files for a new year or to consolidate files), and the Reconfigure program to redefine your computer system (printer and modem connected).

Continued on pg. 117



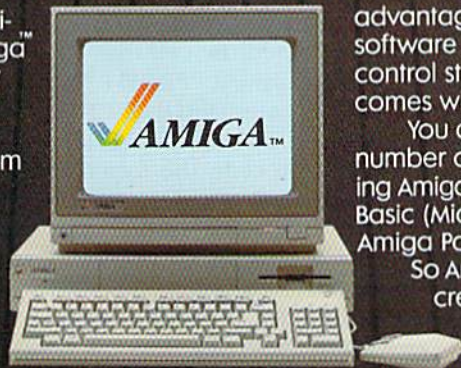
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Pocket Planner 128

Computer: Commodore 128
Publisher: Digital Solutions
 30 Wertheim Court,
 Unit 2
 Richmond Hill, Ontario
 L4B 1B9 Canada
Medium: Disk
Price: \$49.95

Pocket Planner 128 is a business-quality, full-featured package that includes both a spreadsheet and graph generator. It takes advantage of the Commodore 128's memory and expanded keyboard. This review describes *Pocket Planner 128* when used on the Commodore 128 in 128 mode using an 80-column display. The program's features are almost identical when used on either the Commodore 128 using a 40-column display or in the Commodore 64 mode.

The spreadsheet uses traditional formula and cell formatting syntax, and can be displayed with or without a grid overlay to separate individual cells. The command lines display the contents of each cell, its status (protected, format, type, content), and the name of the current file in memory.

Anyone who has used an electronic spreadsheet before will appreciate the sensible selection of command and editing keys used here. For instance: To open a window, press the CTRL key and "w." To close the window, again press the CTRL key, but instead of the lowercase "w," press uppercase "W." Most of the key-activated commands toggle between shifted and un-shifted. To define a range, put the cursor in the first cell and press CTRL and "r" (for range), then move to the last cell you want included in the range and press CTRL and "r" again. The range will be highlighted and you can move, delete, copy, protect or sort the range with a single stroke.

If you forget a command, instead of searching through the manual, press the HELP key. This displays a brief description of all the features avail-

If you are a Commodore 128 owner looking for a powerful spreadsheet which takes advantage of the 128's power, special keys, 80-column display, and hefty memory, Pocket Planner 128 fits the bill.



able and the keystrokes needed to accomplish them. If the brief description is not sufficient, pressing HELP again will call up more detailed information. Novice and experienced users alike will appreciate this.

Formatting, editing, moving, copying and evaluating cells is done in the traditional way, but *Pocket Planner 128* includes some nice features not found on other spreadsheets. One of the nicer features is the ability to NAME a cell. For instance, let's pretend cell H65 is a formula which contains the profits of your company, and somewhere else in your spreadsheet you need to divide the result of that formula by 12 to get a monthly profit average. Normally, you would have to remember which cell contained the formula for profit and then reference it in the new formula. In this case, if you named the cell that contains the profit formula "PROFIT," you would simply enter "PROFIT/12" to get your answer. To name a cell, all you need do is precede the formula with the name and a colon: "PROFIT:@sum(A23,M23)." The program has an internal checker to prevent you from accidentally duplicating names.

Heavy users of spreadsheets will be happy with all the math functions (addition, subtraction, exponentiation, modulo, absolutes, logarithm, random), multiple cell functions (sum,

minimum, maximum, count cell), as well as trigonometric functions, logical operators, and conditional statements supported by *Pocket Planner 128*.

The program's sheet size is a healthy 100 rows by 250 columns, equal to 25,000 cell locations. And because the program reserved 64K of memory for file use, there is little danger of running out of memory when creating even the most elaborate spreadsheet. Each cell can be as small as two or as large as 78 characters wide.

Editing a cell is logical too. Again you use the toggle sequence of either the CTRL key or Commodore key, and the first letter of the command, lowercase to activate and uppercase to turn off. For instance, to protect a cell from accidental change, it can be protected by putting the cursor in that cell and pressing the CTRL key and "p." Now the cell's contents (value, formula, label) cannot be tampered with until the cell is unprotected by pressing CTRL and "P." To print a sheet, press the Commodore key and "p," but to first select print options, press the Commodore key and a shifted "P."

The spreadsheet can be evaluated either automatically or manually, and performed either horizontally or vertically. A bit slower method that takes

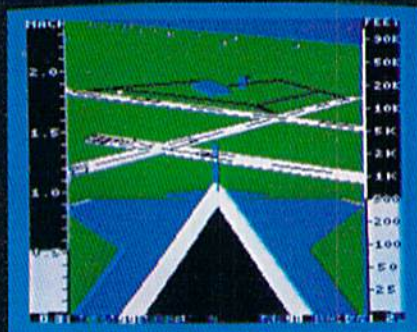
Continued on pg. 24



F-16 Dogfight with Enemy MiG-23 Fighters



F-18 on the Deck of a Nimitz-Class Aircraft Carrier (Control Tower View)



F-16 High-G Pullout over Detailed Wargame Scenery (Rear View)



From the author of Flight Simulator II comes a new dimension in realism. Jet simulates two fast and maneuverable supersonic jet fighters, a land-based F-16 or a carrier-based F-18. The simulator includes modern electronic flight instrumentation and the most advanced weaponry available. Jet's simulation sophistication, combined with excellent visual attitude references, makes it truly enjoyable to fly.

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Jet will run on any Commodore 64 or Commodore 128 computer with one disk drive and either color or monochrome monitor.

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SOFTWARE REVIEWS

into consideration formula locations which refer to cells not yet updated is called Smart evaluation. This method will be preferred by new users of spreadsheets since it takes into account all formulas referenced by cells regardless of location. This assures accuracy no matter how randomly your spreadsheet is designed.

Editing and moving around the spreadsheet is performed with word-processing-like commands as well as the traditional spreadsheet commands. If you use a word processor more often than a spreadsheet, you'll appreciate these friendly and familiar controls. Two of the most helpful are the Search and Search/Replace commands. They work like traditional word processing commands and make finding and changing data quick and accurate. The program also allows an unlimited number of windows, as well as the ability to freeze title columns and rows.

One of the more impressive features of *Pocket Planner 128* is the graph generator program. This lets you illustrate sections of the spreadsheet using either simple bars, stacked bars, lines or pie graphs. These graphs can be simulated on the monitor's screen, dumped to a printer, or saved on disk where they can be recalled by either *Pocket Planner 128* or integrated into Digital Solutions' word processor, *Pocket Writer 128*. I found this a welcome option since numbers alone can't show the relationship between data as well as graphs, nor do they carry the visual impact of graphs. The fact that a graph can be created at any time (you don't have to dump the spreadsheet to use graphs) and can be printed easily is a real plus.

Printer compatibility is an important consideration when you purchase any business program. Compatibility here is accomplished by loading an individual printer file which matches different printers when *Pocket Planner 128* is first run. The title screen lists all the printer files stored on the disk. To select one, just move the cursor to the correct file and press RETURN. The printer module will load and automatically set the default values for that printer. If your printer is not among those listed, a section of the manual is de-

voted to helping you create your own printer module.

Another feature if you have a dot matrix printer is sideways printing. Because spreadsheets are normally designed wider than the width of 80-column paper, printing them can be a problem. Digital Solutions solved this problem of printing wide spreadsheets by including an option to dump the sheet sideways. This option can be selected directly from the main program and does not require saving and loading another program to perform. If the printer used is not capable of performing sideways printing, the sheets can be printed in the traditional method. If only a section of a sheet is needed, it can be printed by first defining a range and then dumping only that range.

The one shortcoming of *Pocket Planner 128* is its 64-page reference manual. Although the manual contains all the information needed to use *Pocket Planner 128*, finding the information can be confusing. The table of contents and index help, but I found myself thumbing and scanning for details which I remembered reading, but couldn't locate.

If you are a Commodore 128 owner looking for a powerful spreadsheet which takes advantage of the 128's power, special keys, 80-column display, and hefty memory, *Pocket Planner 128* fits the bill. If you are a Commodore 64 owner in need of a spreadsheet you can use now but which will move with you when you buy a 128, *Pocket Planner 128* fits your bill too. Because *Pocket Planner 128* is one of a trio of integrated programs from Digital Solutions, data created or stored by it can be used and duplicated by the word processor, and can use data stored on the data base. This compatibility extends even to the ability of the word processor being able to duplicate graphs created by *Pocket Planner 128*.

Pocket Planner 128's impressive capabilities, multiple features, logical design, portability and reasonable price mark it as a product the serious user should consider.

Pocket Planner 128 and its sister program, Pocket Writer, were formerly titled Paperback Planner and Paperback Writer.





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Rags to Riches Accounting

Computer: Amiga
Publisher: Chang Labs
 5300 Stevens Creek
 Boulevard
 San Jose, CA 95129
Medium: Disk
Price: \$499

Rags to Riches consists of three modules, available separately for \$199 each or \$499 as a set. General Ledger, Accounts Receivable and Accounts Payable comprise a package for general accounting using the standard double-entry system. It provides a full audit trail, which is extremely easy to use, even if you've never before tackled such work.

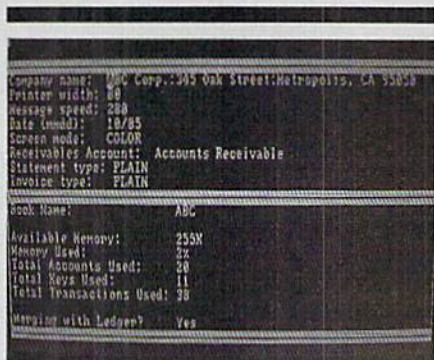
The documentation, done in spiral binders so the books will lay flat, are clear and concise, taking you step-by-step through the many phases of posting, billing, and check-writing. More than that, each book has an appendix that teaches the basics of accounting to make the arcane science of numbers a bit easier to understand.

Included with the General Ledger disk are templates, covering the accounting needs of more than two dozen types of small business. This makes it easy to get started—you can choose the one you need, make any minor modifications, and start working immediately.

In each of its modules, *Rags to Riches* fully utilizes the power of the Amiga by dumping the whole program into RAM. With no need to access the disk, the program really takes advantage of the Amiga's speed. Enter amounts into an account, make notes, then watch the "bottom line" carefully as you select "Post." Don't blink or you'll miss the change of totals.

As you're working with an account, *Rags to Riches* continually displays the "bottom line" on the lower half of the screen. I have not seen this feature on any other accounting package, and I consider it unique and very valuable.

Rags to Riches works on three levels of expertise. The first level, Learn-



The three modules of Rags to Riches are integrated, and support a combination of 5,000 accounts, customers and vendors, and 10,000 transactions.

The screenshot shows a financial statement with the following data:

Account:	Interest Income	5,585.00
Income:		
Month:	9/22	
Income:		11,827.87
Expenses:		5,752.99
Est. Profits:		5,313.88
Assets:		175,351.31
Liabilities:		65,932.58
Net Worth:		109,418.01

At the bottom, it says "Rags to Riches (c) Chang Labs 1985".

er, replaces the bottom line with a paragraph of instructions. At the second level, Know, the bottom-line screen is again visible and briefer instructions appear in a scrolling marquee-style line at the top of the screen. This feature is for those who have been using the package for some time, but who may require prompting here and there. The third level, Expert, assumes you know what you are doing. However, it is possible to call up help at any time should you suddenly begin to suffer from amnesia.

Completely menu-driven, *Rags to Riches* displays commands at the top of the screen. Cursor keys are used rather than the mouse to move from one option to another, which allows greater speed and less hand move-

ment. The cursor, HELP and numeric keys form a compact cluster at the right side of the Amiga keyboard, and 90% of the operations are done with those keys.

Within each module is an Options selection, somewhat comparable to Preferences on the Workbench disk. This gives you final control over the printout without leaving what you're doing. It also allows you to control your display, selecting between "black and white" and color. (On the Amiga, "black and white" is actually white on blue.)

The colors of *Rags to Riches* are intense and you may want to adjust the contrast and brightness controls to compensate. I prefer using color, not only because it shows debits in red, but because in the Accounts Receivable package, the various agings of outstanding credit are color-coded. After only a short time, you'll know by color alone that an account is over 90 days old, thereby allowing you to put yourself in raging mode sooner.

The three modules of *Rags to Riches* are integrated, and support a combination of 5,000 accounts, customers and vendors, and 10,000 transactions. Once an account is set up and saved to a data disk, all three modules can access that disk and add or change information. Work done in receivables or payables is then posted to the general ledger with only a few keystrokes.

Rags to Riches is a well thought-out accounting package. Rather than simply porting a tried-and-true program to the Amiga, Chang Labs rewrote it to take advantage of the Amiga's speed, memory and keyboard layout. In addition, Chang Labs offers user support for the first 90 days through a toll-free hotline. You may also order invoice and statement forms to be used with Receivables and checks that are compatible with Payables.

If you have a small to medium-size business and have been thinking about taking over your own accounting, this is the package to use. If you don't already have an Amiga, it is a good reason to buy one.

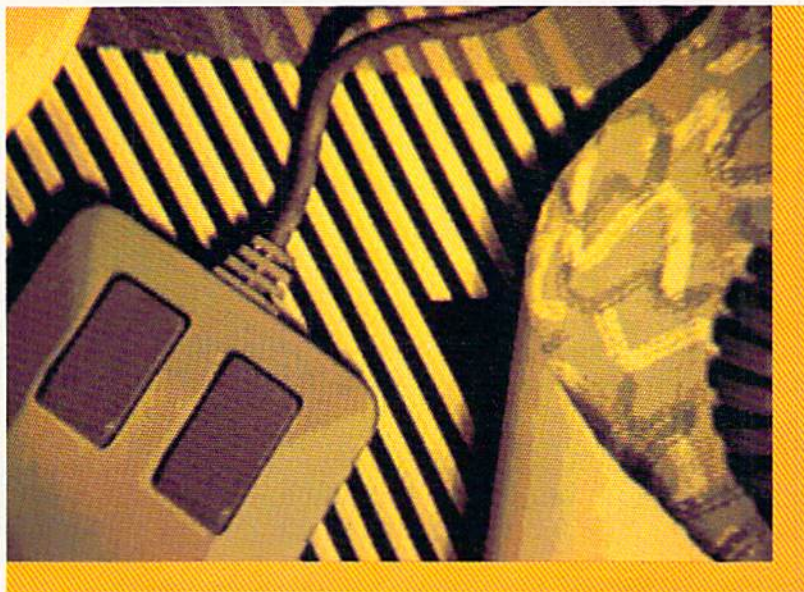
Ed. Note: An updated version of *Rags to Riches* will be available by mid-summer.

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Kung Fu: The Way of the Exploding Fist

Computer: Commodore 64

Publisher: UXB

Spinnaker Software
One Kendall Square
Cambridge, MA 02139

Medium: Disk

Price: \$24.99

Even if you're self-defenseless, *Kung Fu: The Way of the Exploding Fist* will have you donning your black belt in no time. It provides the scenario, setting, and struggles necessary to transform a common joystick-tapper into a karate prodigy.

The tale is told of your abduction and subsequent imprisonment on a small island off Okinawa, Japan. Your captor is an evil ruler of the world's largest remaining Ninja sect, a disturbed dictator who has become jealously obsessed with your reputation as a Kung Fu expert. You have been forcibly summoned to this isle pen for a murderous test of strength. One by one, each member of the Dark Master's elite inner cadre will face you in

*One by one,
each
member of
the Dark
Master's
cadre will
face you in
a fight to
the death.*



a fight to the death. Defeat ten successive opponents, each one slightly better than its predecessor, and you will be granted your freedom. Lose even a single bout, and the arena will be your grave.

These matches, each presented as a separate conclusive affair, are watched at ground level from a side-view perspective. The contestants approach one another in the classic stance, attempting to inflict damage with quick bursts of martial artistry.

Controlling your character's movements is remarkably simple. Each of the joystick's 16 possible positions (eight with the fire button depressed and eight with it released) represents a karate move. By nudging your controller in any direction, you instantly spring your fighter into action. So a quick, almost undetectable push-pull on the stick can initiate a combination as simple as a short forward step with a punch to the face, or as com-

Continued on pg. 122

Alive and Kicking Getting Your Kicks Without Getting Killed

If you are a newcomer, the first step to survival is to concentrate on learning the basic karate techniques. Using the documentation, study the 16 joystick moves until they become second nature. Remember, once a match begins, there won't be any time to check reference charts. After the moves are memorized, you should first practice them against a stationary opponent in the two-player mode, then press on to face the feared forces of the Dark Master. The following tips might be helpful.

- As mentioned earlier, your opponent's skill level will slowly increase as you make your way through the computer-controlled ranks. For scoring sake alone, it pays to take advantage of the slow

reaction time of your challengers in the preliminary rounds. Bonus points are awarded for quick dismissals, so don't be afraid to really tee off on these weaker rookies with some punishing knockout blows. These techniques are risky and inadvisable against a more experienced opponent, so put your best foot forward early.

- If you have a substantial point lead over a tough opponent, it might be strategically sound to move to a defensive stance and try to wait out the clock. By dropping into a low crouch and executing a series of forward sweeps, you can make it virtually impossible for your challenger to deliver the high-scoring offensive thrusts he needs to win.
- With experience, you will discover that every attack has a successful counter-attack. With this in mind, it can be to your advantage to study the tendencies of your com-

puter opponent, who, unlike a human foe, does not possess the ability to change his attacking approach once his strategy has been uncovered. With a little practice, you can often lure your challenger into making an expected move, one which you can easily counter for victory.

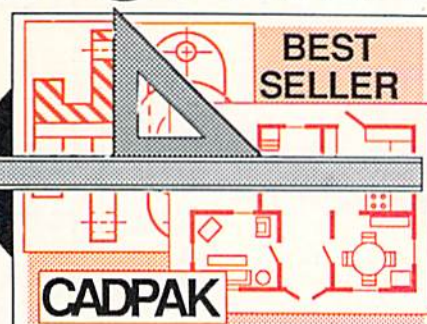
- Throughout a bout, there will some times when both contestants inadvertently move too close to each other, putting themselves in a position where none of their offensive moves can be used effectively. Most players' first reaction is to try to initiate contact by taking a step back. Unfortunately, this style retreat usually puts you in an awkward fighting position, leaving you very susceptible to a quick attack. It is much safer to move backward with a somersault, a technique that will move you further faster, without the risk of an enemy attack. **C**

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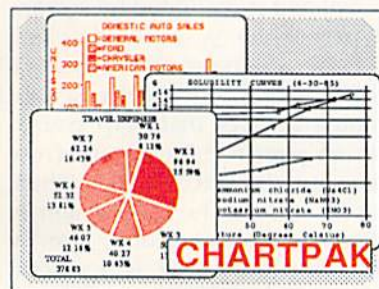
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Beyond the Forbidden Forest

Computer: Commodore 64

Publisher: Cosmi

415 N. Figueroa Street
Wilmington, CA 90744

Medium: Disk

Price: \$19.95

For those of you who survived the original *Forbidden Forest*, you can now take another crack at it. For those of you who did not survive, and who despair of ever surviving, take heart: *Beyond the Forbidden Forest* has a "resurrection" mode.

Beyond the Forbidden Forest has been designed to be not only a game with newer and deadlier challenges, but to showcase programmer Paul Norman's latest trick called OmniDimension—you play the game in four dimensions. The fourth dimension is time, of course, and it is running out.

But what about the other three dimensions? This is not another one of those games where lines converge at a distant point in an attempt to convey a feeling of depth on your monitor. This one really does have three dimensions, as nearly as can be represented in two dimensions, and if you aren't extremely careful, you may fire an arrow into your own forehead.

As in the original game, you control a lone archer in his travels through a magical forest. At the start, you have a non-perilous demo mode to get the feel of joystick control. Press F7 and you are beset by monsters that should not exist even in the imagination.

The giant scorpion—about the size of a large dog—is your first adversary, and you may temporarily avoid him by taking a path perpendicular to his. Yes, perpendicular. If you and the scorpion are both in the foreground moving toward one another, you may stave off death by moving into the background. And if something blocks your way, just walk around it. Hide behind it if you like, at least until you have an arrow notched in your bow.

The dimensional movement you

You control a lone archer in his travels through a magical forest in a fully three-dimensional challenge.



have in *Beyond the Forbidden Forest* is so new and so fun that you may just want to walk circles around a tree until you've convinced yourself it is really happening. Push your joystick forward and walk into the background, watching your figure diminish; pull it toward you and return to the foreground. Be very careful to fire no arrows when facing the foreground, lest you injure yourself.

Should you vanquish the scorpion, a golden arrow will appear in your quiver, as they will for each great beast you slay. Once you've begun collecting golden arrows, death is only a nuisance, because you'll always be resurrected.

Once you've collected four or more of these arrows, you are qualified to enter part two, the Underworld. Here, if you manage to survive the attacks of bats and can get past the fire-breathing Hydra, you'll enter the lair of the Demogorgon. He, of course, is the most difficult to kill. It can be done, but you must be fast and extremely accurate, using all the skills honed in the previous contests. The

one vulnerable spot on this beast is very small and surrounded by armor.

The play screen is surrounded by a black frame, adding to the illusion of depth. On either side of the screen are aiming devices that help you to zero in on your foe. Notch an arrow by pressing the fire button. Then, while still holding the button, aim in any direction and elevation. Fire by releasing the button. It is a system easy to master.

Like other games from Paul Norman, this one surrounds itself with heavy ominous music. Other sounds are done well and the graphics are superb, as is the animation. The one quibble I have, as I did with the original game, is that I feel some scenes are unnecessarily bloody. When a beast dies, there is sometimes a spray of blood. And when you die, it is usually because some beast is noisily chomping you into bits of blood and gore. I think I could have done with less realistic demises, but all the good points of *Beyond the Forbidden Forest* will probably outweigh that one quirk. They do for me.

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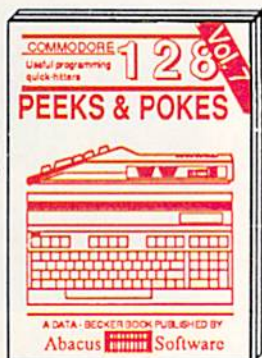
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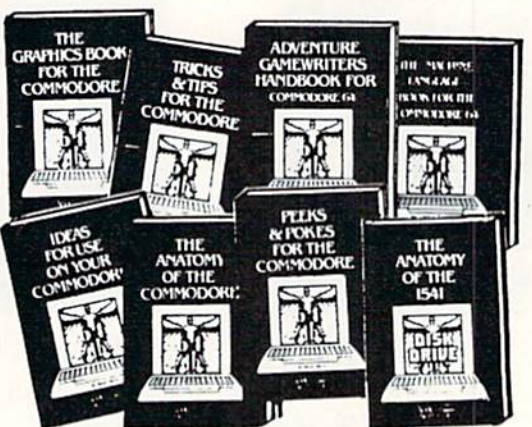
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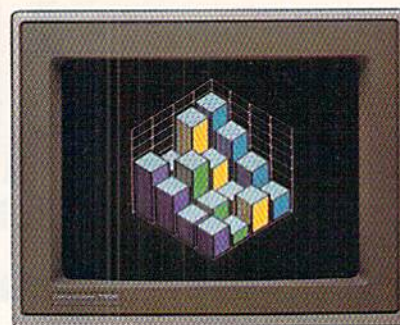
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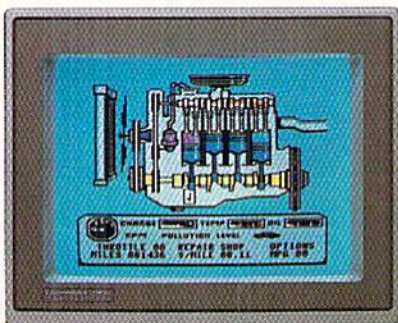
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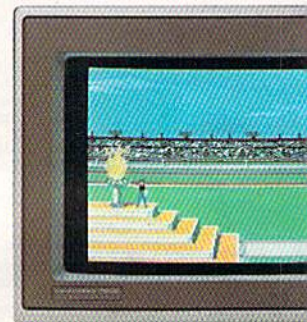
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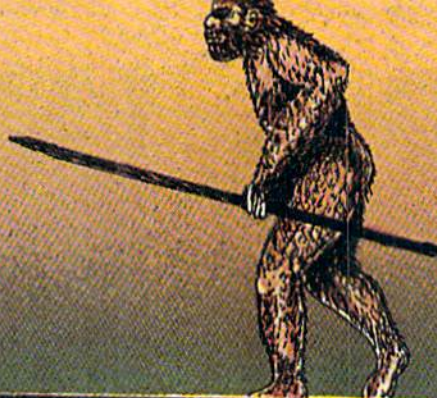
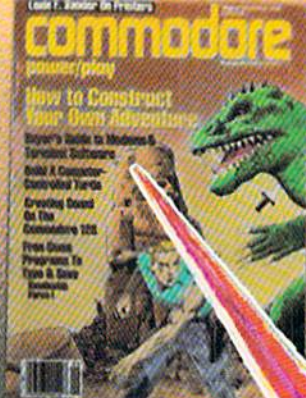
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Chess Programs for the Commodore 64

Chess has been around for approximately 1,500 years. Its origins are traced back to the Indian game called Chaturange, which spread to the Near East and from there traveled to the Arab world, whose peoples then introduced it to Western Europe when they invaded Spain around 1000 A.D. Armed conflict continued to spread the game, as the Normans brought it to England during the Battle of Hastings in 1066. The eastern half of Europe, the Byzantine remains of the Roman Empire, acquired the game through the more peaceful means of trade and cultural interaction.

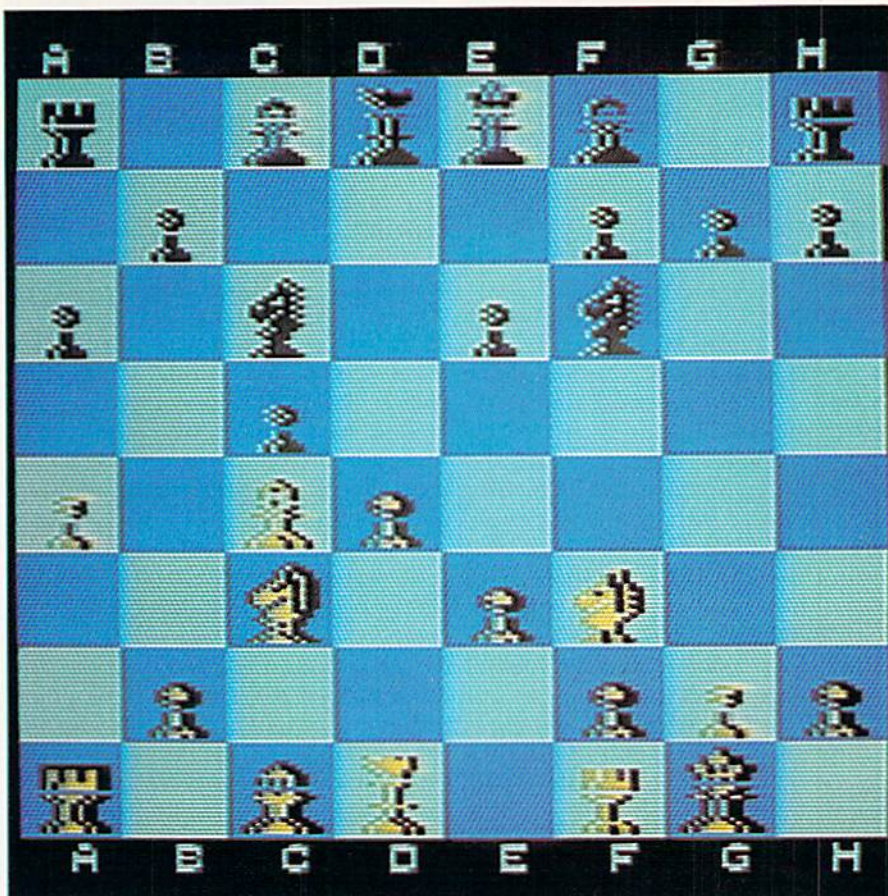
Clubs and associations formed, as chess became widely accepted throughout Europe. The game changed: pieces such as the Queen and the Bishop became more powerful. Political and religious forces began to influence the game, causing expanded levels of promotion for pawns and more diverse piece movement. By 1600, chess had become pretty much standardized into the contest we know today.

The seven chess programs reviewed here are roughly divided into two categories: basic and advanced. The basic programs provide limited graphic renditions of the board, have few or no enhanced play features, and are somewhat restricted in the range of competition. The advanced routines offer more levels of challenge, enhanced playing and tutorial features, and, in one instance, the choice between different sets of playing pieces and 2D or 3D views.

Chess Champion

The first title reviewed is also the newest on the market. ShareData has released *Chess Champion* as part of its \$8.00 a disk Load'N'Go series. That's right, \$8.00 per application, whether it be games, business programs, or educational software. With a price this low, you might expect almost nothing in return.

The good news is that *Chess Cham-*



Whether you're a beginner or an expert, one of these seven chess programs will be right for you.

pion proves to be an excellent value, despite the lack of written documentation. Operating instructions are included on disk, which is why there is no written information on how to play the game. ShareData advises that you make a back-up before running the program. Since the disk is not copy protected, regular copy utilities work fine.

Computerists considering this program should have prior knowledge of the game or be willing to learn it from other sources. With that in mind, novices will still find this a cost-effective introduction to a great pastime. More advanced players can still make use of

this low-priced bargain, though the challenge will fall off relatively soon.

As with all the programs reviewed here, this one handles Castling and En Passant maneuvers. Like most of the others, entries are keyed in using a form of the Cartesian coordinate system known as algebraic notation. That is, the rows (ranks in chess terminology) are marked A through H and the column (files) are marked one through eight. Moves are entered via the keyboard. For example, D2-D4 specifies movement of a pawn from square D2 to square D4.

Making use of the function keys, you can list on-screen previous moves, return to the menu to change the board setup, or start a new game. The RESTORE key accesses the main menu where you can choose from two different chess programs: "Champion" or "Chess for Two." This review will concentrate solely on "Champion," which is in itself worth thrice the price of the program.

Seven levels of play are available, and you can choose Black or White. You cannot force the computer's

C64 Chess Buyer's Guide

move if you feel it is taking too long to respond, nor can you request help from the program. On a brighter note, invalid moves are not permitted. When they do occur, "Champion" gives an error message, notifying you about the problem. Those less than proficient with a keyboard will be happy to know that the INST/DEL key is active, allowing edits of move entries before you press RETURN.

Response time is good, a measurement which must be adjusted as higher levels of play are selected. (The computer is allowed more time to research moves at higher challenge levels.) The graphics are crisp, black and white pieces on blue and light blue squares. Every piece is easily identifiable as to rank. You can only play against the computer, so you cannot watch the computer play itself or have it referee between two human contenders. Again, you must look at overall value and effectiveness. For \$8.00, ShareData's *Chess Champion* is a surprisingly strong entry in the basic class of Commodore 64 chess programs.



Grandmaster Chess

Artworx Software offers a chess program entitled *Grandmaster Chess*. Though more recent packages have surpassed it in depth, it does provide some unique features, all for \$24.95.

By using the function keys, users can alter the color of the squares (both light and dark) as well as the background. Some very interesting combinations are possible as you cycle through the 64's 16-color range. Besides having cosmetic appeal, different colored boards help reduce eyestrain during those long sessions.

Grandmaster Chess allows you to force the computer's moves, restart games at any time, switch sides, and

For \$8.00, ShareData's Chess Champion is a surprisingly strong entry.

take back moves. However, the take-back feature only works within two plays. That is, it only erases the most recent moves made by each side. By comparison, the other programs take back every move right up to the start of the game.

There are ten levels of play, with one designed specifically for that long distance event, postal chess. The graphics are clean, but use sparse representations of chess pieces. The user manual is brief and to the point, covering program functions and the game's history. The best part of the manual is its bilingual nature, French as well as English. *Grandmaster Chess* is the only title with an international flavor.

An on-screen digital clock tracks total time spent by each side. This is a great addition, another feature not present in any of the other products. The list of options ends with a tutorial mode, where the computer offers moves upon request.

Overall, *Grandmaster Chess* is an inexpensive program with some very unique features. It can be a great gift for French speaking individuals or an excellent diversion in French class.

Sargon II

Hayden's *Sargon II* is named after the Assyrian king who reigned from 722 to 705 B.C. It is essentially the same as *Chess Champion*, but with some extras.

Sargon II has written documentation covering operation of the program, but little else. Also an entry level program, it leaves on-line tutorials, chess problems and other advanced offerings for more powerful—and more expensive—titles. A hint mode is accessible through the F3 key, and as in *Chess Champion*, you can change the board setup. *Sargon II* ex-

plains this procedure, which is a bit cumbersome compared to the methods included in newer products, but the process is workable nonetheless. This feature is useful for entering layouts illustrated in chess books and newspapers, as well as taking back moves.

Sargon II offers all the functionality of *Chess Champion*, plus slightly more, along with basic written instructions. Widely discounted, the program is a good purchase.



Sargon III

The first entry in the "heavy-weight" division is also from Hayden Software. Starting where *Sargon II* left off, *Sargon III* is considerably more advanced.

Sargon III drops the colored graphics of *Sargon II* for the more traditional black-and-white look. The pieces are still crisp, clear and easily identifiable. The rank identifiers (A-H) are visible whenever the board is displayed, unlike *Sargon II* where the F7 key must be used to toggle them on and off. It is also very easy to flip between the board view and the move listing screen. If you are like most players, you'll play over 90% of a game looking at the board.

Extensive documentation is another major difference between the two *Sargons*. Operating instructions, the basic rules of chess (per the United States Chess Federation), and numerous chess problems are included. Unlike others mentioned in this article, the 64 version of *Sargon III* is a two-disk program. One loads the program, the other has 45 chess problems and 107 of the greatest (complete) games in history. Each of the situations and games can be loaded for analysis and study. The situations are also discussed in the manual.

With *Sargon III*, you can not only

C64 Chess Buyer's Guide

take back moves, ask for help or force the computer's move, but also switch sides with the 64, invert the board (so black is at the bottom of the screen) or list all moves to the printer. Other nice features include the ability to move pieces with a joystick (in addition to the keyboard), replay saved games (including the 107 on disk), or alter the color of the squares, pieces, text and background. Board setup can be altered for problem solving or analysis, and it is even possible to print out the current board position of all pieces.

The nine levels of play can be extended to 18 if you prevent *Sargon III* from thinking while you are taking your turn. You can, of course, play the computer, watch the computer play both sides, or instruct it to verify moves between you and a human opponent.

Sargon III is one of the best Commodore 64 chess programs available. It is suitable for everyone from raw recruits on up.

Mychess II

The Datamost entry, *Mychess II*, is, in my estimation, the dark horse entry in this comparison. Less well known than some of the other programs, it is surprisingly powerful, making it one of the best values around.

Like the other programs mentioned so far, *Mychess II* accepts coordinate entries via the keyboard. Unlike others, the hyphen is automatically entered, thereby reducing the keystroke count. Users can take back moves simply by pressing the left arrow key, rotate the board (90 or 180 degrees), switch sides, or ask for help. You can also change play level anytime, output the moves to a printer, force the computer's move, or replay games. There are 128 games stored on the reverse side of the program disk, all available for replay, analysis or study.

Like *Sargon III*, the nine levels of play can be expanded to 18. Furthermore, you can choose between color or black and white pieces, select 2D or 3D board views, or play with one of several different piece sets (modern, traditional). You can have the program highlight all legal moves per side or identify attacks or defensive postures on designated squares. No other program for the 64 offers this

How About a Nice Game Chess! *is by far the most comprehensive and informative "introductory" program.*



array of features. Odesta's *Chess 7.0* is the only one that even comes close.

As expected, you can play the computer, another person, or study a computer game. On-line help can be accessed easily, and most commands are CTRL-key driven. There is also a variable board setup for situation analysis.

The documentation is well organized, providing a concise tutorial as well as clearcut operating instructions. Novices will not feel overwhelmed, even though *Mychess II* is so well endowed.

Mychess II is graphically outstanding, challenging and packed with features, many of which are not duplicated on any other 64 chess program. It is suitable for you whether you know nothing about the game or are an expert.

How about a Nice Game of Chess!

Odesta, the publisher of our next two titles, has an outstanding reputation for its chess programs. Even though one is designed to address the needs of less proficient players, both have sufficient features and capabilities to merit inclusion in the advanced category.

Basically, *How about a Nice Game of Chess!* is a scaled-down version of *Chess 7.0*. This program comes complete with an on-disk tutorial which provides check and checkmate scenarios, numerous openings, middle game tactics and endgame maneuvers. This menu-driven program also includes a demo routine which provides insight into the program as well as the game.

Instead of entering coordinates with the keyboard, you move by placing the flashing cursor on the desired piece and moving it to the target square. Pressing RETURN places the piece as designated. The Inward option displays attacks and defenses on a selected square, and the Outward option highlights squares attacked and defended. Both of these functions work on a per-turn basis. That is, they automatically switch off after you make a move.

How about a Nice Game of Chess! recommends moves, allows take-backs, and replays groups of moves or entire games. You can also switch sides, alter board setup, play against the machine, contest an antagonist, or watch the computer control both sides.

In addition to the nine levels of play, there is a practice mode for training purposes. The documentation details strategic and tactical maneuvers. It is by far the most comprehensive and informative "introductory" program.

Chess 7.0

The other offering from Odesta is their top of the line *Chess 7.0*. Both programs are very similar in appearance and functionality, but *Chess 7.0* has additional bells and whistles. Also, its levels of challenge are more extensive, perhaps the most wide-ranging of all the programs available.

One problem cropped up early on during the review—trying to load the program. According to the loading instructions on the insert sheet (meant to correct inaccuracies or omissions in the manual) you must type LOAD-“CHESS7.0”, when in reality LOAD“*” is the only command which works. Once I got past this minor problem, *Chess 7.0* performed flawlessly.

The now standard features of inverting the board, altering setups,

C64 Chess Buyer's Guide

changing the level of play (17 without having to tamper with the program's "think" time), and taking back a move are all present. You can list the moves, switch sides, replay current or any of the 30 games saved to disk, display attacks and defenses on a square (Inward) or highlight squares attacked and defended (Outward). A "Look" feature depicts moves the computer expects in the current game.

Chess 7.0 provides hints as well as analysis and study capabilities within the replay mode. The documentation is very similar to and of the same high quality as that included with *How about a Nice Game of Chess!*


To get users started, there are two demos: one which runs automatically upon loading, the other accessible from the menu. (Like Odesta's other product, *Chess 7.0* is menu-driven and uses the cursor to position

pieces). The second demo is very detailed in that it not only plays a game, but also explains the options before actually running them.

One feature not encountered previously is the "Blind" play option. Choosing this either camouflages the pieces as diamonds, or makes them completely invisible. I don't know about you, but chess is enough of a challenge when I know what the pieces are and where they are, much less when I don't.

Computer versus computer, human against computer, or human versus human are all possible with this truly remarkable offering. Of all the programs reviewed here, it probably poses the greatest challenge.

Each of these programs plays the fundamentals flawlessly. They are all worthy contenders—some are just better gifted than others. Decide what your level of competency is and base your decision on that.

For those interested in knowing more about chess, there are numerous books and articles on the subject. Additional information can also be obtained from the United States Chess Federation, located at 186 Route 9W in New Windsor, New York 12550. 

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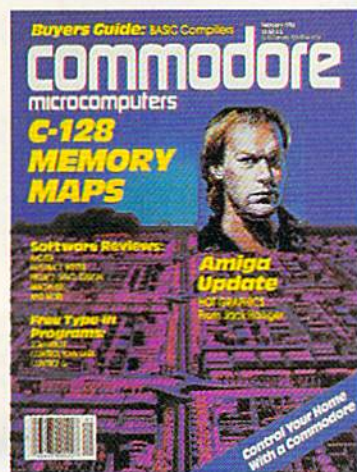
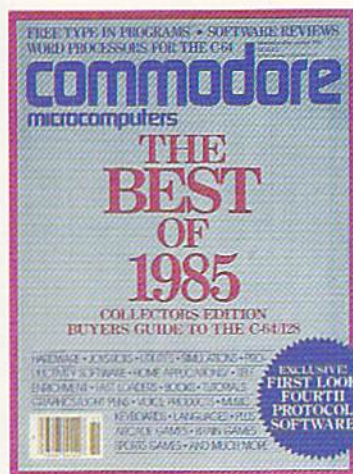
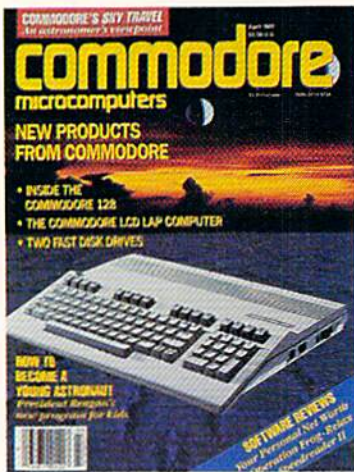
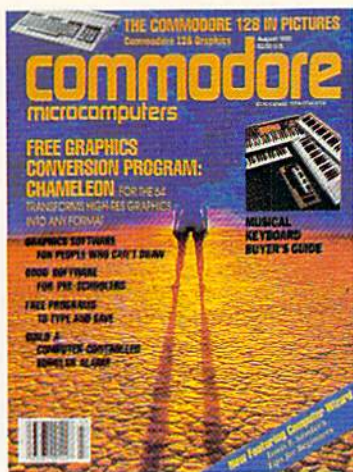
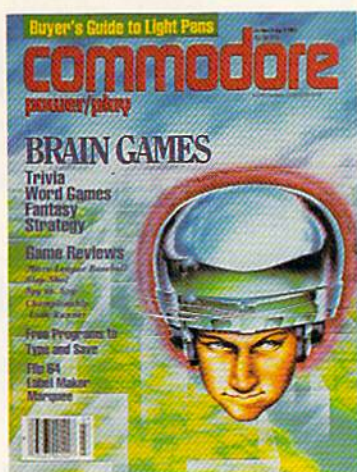
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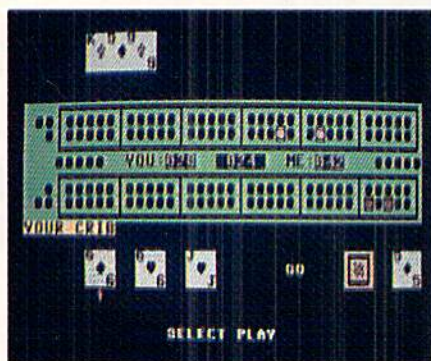
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Updated Traditions

Board Games a la the Commodore 64

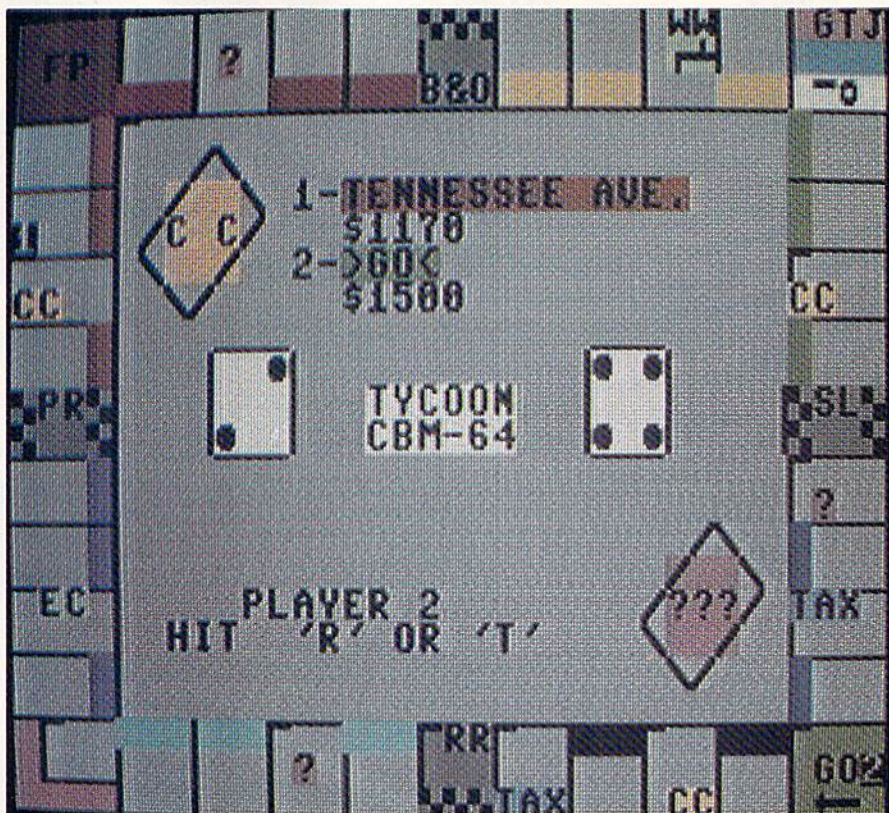
This article takes an in-depth look at computerized board games available for the Commodore 64. One of the greatest things about these electronic classics is the ease with which you can practice any time of any day; you no longer need to wait for a friend. They are also convenient. Since the 64 performs all the calculations, you are more able to enjoy the game at hand. Monopoly® monetary manipulations or bombing battleships, whatever needs to be done, the 64 will do it.



Peg Out

Green Valley Publishing, doing business under the ShareData name, has several board-game products in its Commodore 64 Load 'N' Go series. All ShareData disks in this series are \$8 each, and some have more than one program on each disk. None have published documentation, to keep the costs at a minimum. One title is *Peg Out*, a cribbage routine for those who already know the game or those willing to learn the ropes another way, since it lacks instructions.

While cribbage is essentially a card game for two players, points are scored by moving pegs on a board. There are various ways to score: nobs, 15's, runs, pairs and flushes. A nob is scored when the jack is of the same suit as the card turned face up. Fifteens are exactly that: Points are awarded for each combination of



One of the greatest things about these electronic versions of classic board games is that you can practice any time.

cards whose totals tally 15. Runs are series of cards such as a two, three and a four, while pairs are pairs of the same numbers or face cards. A flush is the same as in poker: Every card is the same suit.

There are actually two versions of cribbage on the floppy, both of which work with a joystick plugged into port #2. The regular version has the computer score all the points for both sides, and the other has each side count their own. In the 64's case, it never misses, so, since a player can take credit for an opponent's uncounted points, you better know what you're doing. Believe me, the 64 doesn't need another edge.

The 64 shuffles the deck, deals the

cards, and moves the pegs after calculating the score. It compliments you on a good play, and taunts you on a bad. *Peg Out*'s graphics are adequate for the task at hand, and response is fast. *Peg Out* verifies all plays, disregarding illegal responses. Error messages point out any problem so you can easily address it.

Peg Out is tough competition. Since there are no user-selectable skill levels or handicaps, novices should be prepared for some humiliating experiences. But for the price, you can't beat it.

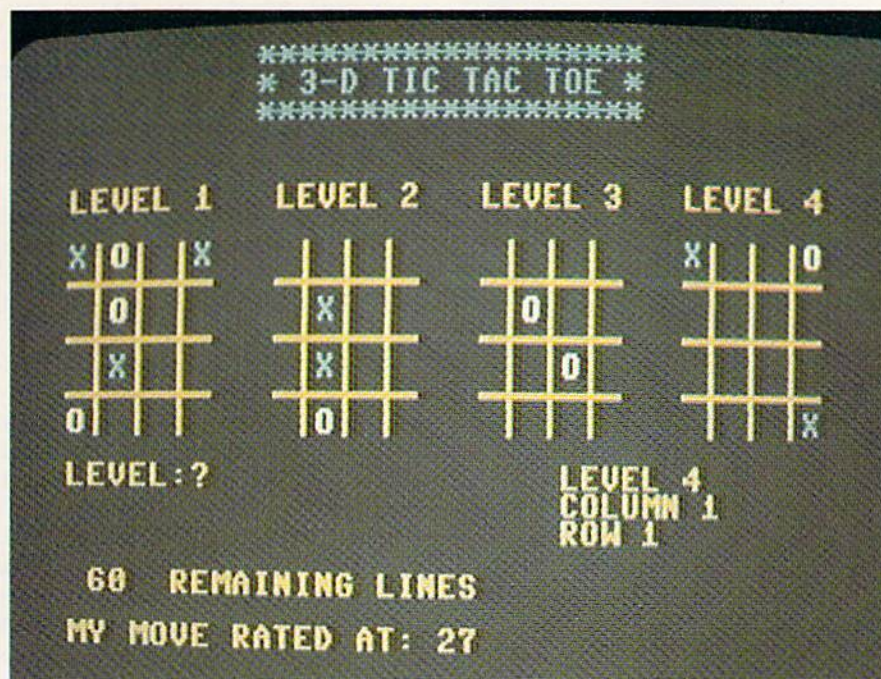
Board Game Challengers

Another ShareData product, *Board Game Challengers*, has three games in one. The two board games on the disk are *Battleship* and *Real Estate Tycoon* (Monopoly-like). The third is a straight rendition of the card game *Solitaire*.

In *Battleship*, one player faces off against the 64. Up to seven ships can be placed horizontally or vertically on a grid, and locations cannot overlap. All ships are three grids in length.

A ship is positioned or an attack is launched by entering row and column coordinates. For instance,

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"AOV" places a ship vertically at grid location AO. "AO" launches an attack against that particular intersection. The first side to sink all of the other's vessels wins. Plain, simple—and addictive!

Misses are designated on the grid as small circles; "X" marks a hit. The program disqualifies incorrect inputs, clearing the way for acceptable entries. The DEL key edits errors before the RETURN key is pressed. You can restart the game at any time by simply pressing the asterisk key.

The only problem with *Battleship* is that it accepts duplicate entries, so be careful not to enter a previously targeted grid location, unless you want to waste a turn. A methodical approach, taking ship length and grid size into consideration, makes it possible to beat the 64.

Program response is surprisingly fast, proving that inexpensive software doesn't have to run like molasses in January. Instructions are included on the disk for anyone not already familiar with the game. As with all other ShareData offerings, the company urges you to make back-ups. Since they are not copy-protected, any copy routine works.

Real Estate Tycoon, on the same disk, is a surprisingly well executed and detailed version of Monopoly. A small but colorful game board is the focal point. Community Chest and

ShareData's \$8 game disks usually feature two or three games.

Chance cards are graphically depicted on-screen, as well as the Free Parking, Jail, Go To Jail and GO squares. Since the properties are too small to be named, they are color-keyed like the original. A pair of "tumbling" dice occupies center stage. Game pieces are the numbers one and two.

Basic operations are straightforward. You select "R" to roll the dice or "T" to view the transaction menu. The computer moves the numerals according to each roll, changing screens to display details about the destination.

When you land on a property, the screen displays an image of the deed for that property. In addition, cost to purchase and cost to build houses and hotels, ownership, number of dwellings already erected and mortgage status are displayed. And if it belongs to the other player, the amount of rent owed is shown.

The transaction menu allows you to review the properties by player, list all properties, build structures, sell properties, mortgage them or display the deeds. You can also return to

the game board or quit entirely. The program rejects incorrect entries.

Gamers can select an Auction option where properties are put on the bidding block if the person landing on them declines the purchase at list price. Highest bidder wins, so you may get lucky. A Free Parking jackpot option adds excitement and much needed cash flow. By choosing this variation, taxes and fines are put into escrow, collectable by anyone landing on the Free Parking square.

To underline the game's faithfulness to the original, players rolling three consecutive sets of doubles are tossed into the slammer. To gain a reprieve, you must either try for doubles, pay \$50 in cash, use a Get-Out-of-Jail-Free card, or pass three turns and pay \$50 anyway.

Landing on Community Chest or Chance also changes the display screen. Money is automatically added or subtracted from your account, and your marker is moved if necessary. Those passing GO earn the traditional \$200, deposited into their account.

When erecting structures on properties, the computer evenly distributes the allotment. For example, six houses on the orange lots would be split two houses to each property. If another one or two houses (say seven or eight total) were purchased, the computer asks where they should be placed.

As great as *Real Estate Tycoon* is, there is a minor problem concerning the Income Tax square. Unlike Monopoly, the program does not provide the \$200 or 10% cash option. You must cough up a flat \$200 for landing there.

The graphics are pleasing, and, since there are three games on the one disk, all for \$8, you now understand why *Board Game Challengers* is a value you can't afford to pass up.

Just Games (With a Twist)

Just Games (With a Twist) is another offering from ShareData. Like the previous title, multiple games are included (*3D Tic Tac Toe*, *Othello*, and one not reviewed here, *Dominos*). The price is still \$8.

3D Tic Tac Toe is a space-opera version of the game usually played with pen and paper. The board is actually a cube with each level dis-

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played beside the other. No attempt is made at fancy multidimensional graphics, because the result would have been so confusing that the game would be impossible to play.

The object of the game is to get four O's in a row, horizontally, vertically or diagonally before the 64 does likewise with its X's. Entries are placed by designating the desired coordinates, such as Row 3, Column 4, Level 1. Incorrect entries are refused if you forget to clear them before pressing RETURN. Any time the coordinate prompts are available, you can restart the game or quit by entering zero or "Q."

Visually speaking, *3D Tic Tac Toe* is primitive. Use of the 64's character graphics normally means thumbs down, but considering the price, the graphics are acceptable. There are no audio effects, and game play is straightforward. The 64 is a competent opponent. Interestingly, complicated strategies don't seem to work as well as the simple approach.

Othello, otherwise known as *Reversi* and half a dozen other names, is another game of strategy. The objective is to own the majority of game pieces. In this version, you take the white side and the computer takes the black. Each side takes turns placing pieces on the board.

The target square must be empty, it must be adjacent to a square already containing a piece, and the placement must trap one or more of the opponent's pieces between two of yours. Trapped pieces change to the color of

the surrounding pieces. Pieces are placed until the board is filled.

There are three levels of play: Beginner, Average, and Average-to-Advanced. Skill level can be altered mid-stream with just a few keystrokes. Once again there are no audio effects, but the program makes extensive use of the 64's built-in character graphic set. Eight dollars for three games is a remarkable value in itself. Yet the truth is, these games don't need sophisticated programming to make them intriguing, fun and challenging.

Backgammon H

Backgammon involves a pair of dice and 15 pips (game pieces). Based on rolls, pips are moved around on the 24-place gameboard until they are all within the final quarter (the last six spaces or "points"). From here they can be moved off the board. In this human-versus-computer game, the first player to do so wins.

In this computer version of the game, written by Hubert Hutchinson (thus, the "H" in the title), the 15 pips moved by the 64 are red, yours are black. The computer moves its pieces clockwise, you go the other way. Enemy pieces can be bounced from their position, making movement more difficult. By sending lone pieces to the "bar," you (or the 64) interfere with their proper and timely deployment. Even though skill, planning and logic are needed to successfully navigate the board, luck of the roll is equally important.

If the enclosed game rules don't

seem clear after the first reading, novices shouldn't be concerned. Play two or three games and it will all become obvious. Other friendly gestures include the price (\$19.95) and another offering on the same disk, *Euchre*. (Since *Euchre* is strictly a card game, it is not reviewed here.)

The visuals are adequate—a step above the graphics used by *Share-Data*. While not exceptional, they get the job done. Unlike *Real Estate Tycoon*, which simulates tumbling dice, *Backgammon H* just reports the results of its internal random number generator. The original has no sound effects, and the 64 version doesn't either.

Incorrect entries cannot be edited. To prevent entry of an unwanted but legal move, you must enter a bogus destination. For example, a good move might be 13-15, where the piece on space 13 is moved to space 15. But let's say that you meant to enter 11-15 instead of 13-15. Since the origin space is already entered, you can repeat the same space number as the destination. The entry 13-13 will be rejected, and the program will stand by for another move. However, *Backgammon H* does not accept illegal moves. This somewhat makes up for an inactive DEL key.

Backgammon H more than compensates for its run-of-the-mill visuals. Tough competition, a fair price, and an even fairer disk back-up policy all tip the scales in its favor. If one word could best describe the package, it would be addictive.

MicroGo I

I now head for the mystic Orient and the ancient game of Go. The 64 version, known as *MicroGo I*, is published in the USA by Eurosoft International. The national game of Japan, Go has been played for over 4,000 years. A game of strategic and tactical positioning, it is somewhat reminiscent of *Othello* with its black-and-white game pieces. But the resemblance ends there. Go is more complex, offering extremely subtle game play and varying board situations.

Starting with an empty game board, players (two humans, 64 versus 64, or you against the 64) take turns placing black-and-white "stones" on the grid intersections. Positioned pieces can-

SOFTWARE REVIEWS

not be removed unless they are captured by opposing forces.

As with most contests, scoring points is the main objective. This is accomplished by surrounding territory. A single point is awarded for each surrounded vacant intersection or opposing piece. Gamers might try to run up their score by capturing their own pieces, but this is not allowed.

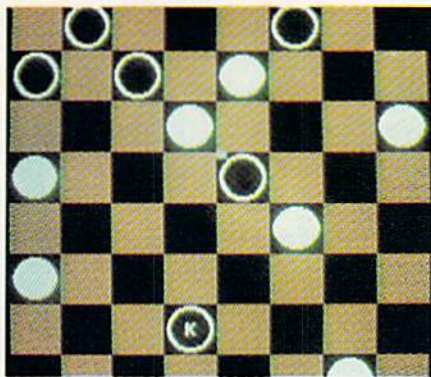
Sometimes the best move is no move, so a player may pass when his turn comes around. You must be careful with this option, though, because three consecutive passes are an automatic resignation. Of course, you can always intentionally resign.

MicroGoI comes complete with the rules of Go on an illustrated reference card. The basics as well as advanced game scenarios are described. The flip side of this guide contains loading and playing instructions.

Besides providing ten levels of play, *MicroGoI* also offers a very helpful tutorial. In addition to demonstrating how to enter moves, this animated routine teaches the game's underlying logic. A beginner's mode highlights potential territory so you can gain even more insight. Until you are up to speed, handicap levels even the odds. On the other hand, levels can also be selected to give your opponent the edge.

A menu of options can be accessed at any time. From this menu, you can change contestants, quit the game, call up the demo, toggle the Beginner's mode on or off, or select skill levels. The stones are placed via the cursor keys or a joystick plugged into port #2. The space bar is programmed to place a piece next to the last placed stone. This saves time when you are duking it out for a particular section of the board.

The graphics, though simple, are more than adequate. Response time is laudatory, and a take-back option overcomes the unwelcome consequences of incorrect entries. The audio effects, limited as they are, have an oriental tinge. Game play is challenging, and more importantly, it remains stimulating as you become more adept. The features and conveniences in *MicroGoI* make it a true value. After playing several sets of *MicroGoI*, you understand why the game of Go has prospered for 40 centuries.



Checkers 2.1

The final program, Odesta's *Checkers 2.1*, is not only replete with features, but also is exquisitely packaged, complete with in-depth documentation.

Taking their cue from the historical impact chess has had on checkers, Odesta has developed *Checkers 2.1* similarly. Playing pieces are black and white, and the program operates on principles similar to those used in computer chess programs. The game relies on an "opening library" of potential moves and replies, and only legal moves are allowed. Various audio effects sound when pieces are moved, but these sound effects can be toggled on or off.

Either a joystick in port #2 or the cursor keys move pieces about. Personal preference is the deciding factor, since both methods have advantages. *Checkers 2.1* is designed so that you must jump if the opportunity presents itself.

As a variation of the standard game, a "give-away" option is available. In this reversal of the usual game, the name says it all: The first one to lose all his pieces is the winner.

Checkers mavens can play the 64, play friends, or watch the 64 match wits against itself. Sixteen different skill levels can be independently set for each side. In case your opponent has become too much to handle, switch sides. Or if playing the computer, ask for advice, force its moves before they are fully developed, or have it play any number of responses to its own moves.

A demo explains the program's features. There is a take-back option which allows you to withdraw up to 30 miscues. Completed or in-progress games can be reviewed a move at a time or in their entirety, just like instant replay. The last 15 moves for

both sides can be seen by flipping to the "listing" screen. This mode, as most of the other features, is activated with a single keystroke.

From level five on up, *Checkers 2.1* thinks about its next moves while it is your turn. To even the odds somewhat, you may want to ask it for advice. But beware! The computer does not always suggest the best moves. And *Checkers 2.1* does not always win, either. (At least that's what Odesta says).

A "Help" key displays the functions and how to access them. On the "Listing" screen, a numeric representation of which side is winning is displayed. Zero is even-stein, positives are in the program's favor.

Game parameters (piece point-values, weighted distance-values) may be changed at will. This indefinitely extends the value and playability of what would normally be a simple, no-nonsense board game reproduced on a computer. Users may vary (and then freeze) the random number generator, which makes sure the 64 does not repeat moves. None of this is permanent, and pressing "R" resets everything to the original default values.

The manual includes playing tips, tactical problems, a brief history of checkers, and an overview of the methods used to program the game. When all is said and done, *Checkers 2.1* is much more than a game of checkers, it is challenging, entertaining, and educational. **C**

Publishers

Backgammon H
Hutchcraft Associates
1132 Dryden Road
Ithaca, NY 14850

Board Games Challengers
Just Games (With a Twist)
Peg Out
ShareData

7122 Shady Oak Road
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Fontmaster II

Computer: Commodore 64

Publisher: Xetec

2804 Arnold Road

Salina, KS 67401

Medium: Disk

Price: \$49.95

Once in a great while, a truly astonishing computer program turns up. *Fontmaster II* is one of them. It's unique among word processors for the Commodore 64—and rare among word processors for any computer.

As the name implies, *Fontmaster II* prints your writing in many different "fonts"—shapes and sizes of letters. Compared to the characters normally available from a dot-matrix printer, the variety of shapes, sizes, and spacings it can produce is astonishing.

Fontmaster II comes with 33 different fonts, each a set of uniquely-shaped characters, ranging from open "block" letters, to "bauhaus," "manhattan," "script," and an exceptionally clean font called "goodtype." There's Russian, Greek and Hebrew. There's even "upside-down" and "mirror." And if those 33 fonts aren't enough, you can design your own.

You can use up to nine different fonts in any single document. And you can change from one font to another whenever you want—even in the middle of a word—just by pressing two keys. In addition, you can select inverse printing: white letters on a black background.

Similarly, you can change the height of letters, making an instant change from normal height to double-height or to half-height. You can even run lines together with no space between them to print larger letters or designs. *Fontmaster II* doesn't provide these, however, so you'll have to design your own.

You can also change the pitch, that is, the horizontal size and spacing of the characters. In addition to pica (10 characters per inch) and elite (12 cpi), there is also "alternate" (11 cpi) pitch and "konnect" (13 cpi). There are also normal, expanded, and compressed versions of each, giving up to



Fontmaster II comes with 33 different fonts. And if those aren't enough, you can design your own.

12 different widths of characters. Furthermore, any of the fonts and pitches can be printed in either normal or proportional spacing.

Proportional spacing deserves special notice because when combined with right-margin justification, it produces somewhat better-looking justified text than most other word processors. There are still extra gaps between words, but they are less noticeable because the proportional spacing generally can get more words to a line.

You can also reverse the display, allowing you to type from right to left. In this mode, the letters appear backward—mirror-image—both on the screen and when printed on paper. This is essential for writing in languages that read from right to left,

like Hebrew and Arabic. There is a Hebrew font and a character set included in *Fontmaster II*. You'll have to make your own if you want to write in Arabic—but that should be relatively easy with the font and character creators included.

The reversing feature, combined with a font called "upside-down," also allows you to print right-side up and upside-down on any page without having to turn the paper around.

In addition, *Fontmaster II* will print up to four columns on a page. If your printer can reverse the direction of the paper, then *Fontmaster II* will do this automatically. Otherwise, it waits at the end of each column for you to roll the paper back manually.

Printing

Fontmaster II has the printer make two passes for each line, each pass in the same direction, and is, in effect, printing graphics instead of using the character sets built into your printer. This is slower than normal printing, but the results are impressive.

If you want faster printing, however, a quick jab at a couple of keys will tell *Fontmaster II* to use the normal dot-matrix mode, and it'll print as fast as your printer can manage. Of

course, the output will be only your printer's normal dot-matrix font. The fancy stuff takes longer.

Printer setup is easy. A few seconds after you load *Fontmaster II*, you see a menu from which you select "Setup." This presents you with a second menu that includes 19 interfaces and 74 printers. Selections are easy, and you can test your selections without leaving the "Setup" menu.

However, only 37 of the printers listed are capable of producing all of the fonts that *Fontmaster II* contains. Another 17 will do all but the three "superfonts"—extra-clean fonts that print about twice as many dots per unit area as *Fontmaster's* "normal" fonts. Most of the other printers can't handle many of *Fontmaster II's* features at all. Therefore, before rushing out to buy a copy of *Fontmaster II*, you might want to study the list of supported printers to find out if your printer can produce everything *Fontmaster II* sends it.

The "setup" file is saved right on the program disk, so it loads automatically along with the word processor. You may even have two entirely different "setup" files, in case you will be using *Fontmaster II* with different printers or different computers.

There are three other programs on the *Fontmaster II* disk that you can select from the main menu: a file translator that automatically converts files from other word processors to *Fontmaster II* format; a fontmaker that enables you to design your own fonts; and a character-set maker for when you want to design special characters that will be displayed on the monitor or TV screen.

Fontmaster II as a Word Processor

As you see, *Fontmaster II* is really something when it comes to printing. But as a straight word processor it's no slouch, either. It does most of the things a word processor should do, and does most of them efficiently. It lets you move blocks of text from one place to another. It finds text you specify and replaces it with something else. It prints headers and footers, superscripts and subscripts. It automatically inserts individualized information into form letters. And it's relatively easy to use.

If you lock out the memory normally reserved for up to eight of the nine fonts that can be loaded in Fontmaster II, the text memory is increased to 36,936 characters or 21 printed pages.

The cursor appears as a blinking, hollow rectangle surrounding the character it is on, rather than as a blinking solid block. This is what you notice upon first using the program. It's a small thing in itself, but indicative of the care that the programmer has put into *Fontmaster II*.

The top four lines of the screen are reserved for a three-line status display and a one-line "ruler" that displays tab stops and the horizontal location of the cursor. The other 21 lines are available for your text.

With *Fontmaster II*, what you type appears on the screen as a 40-column stream of characters. That is, there is no word-wrap; words too long to fit on a screen line are broken and continued on the next line. This makes proofreading somewhat more difficult, but most people get used to it quickly. It has the advantage of letting you know exactly how many spaces you have at the end of a screen line. But don't forget, your text is not formatted the way it will appear on paper.

However, there is an 80-column video preview mode in which you see your text more or less as it will look when printed. For this display, *Fontmaster II* prints to the screen two half-width characters for each of the places normally available on a 40-column screen line. These narrow characters are clearly legible on a monitor. They might not be clear enough to read comfortably on a TV, but you can at least check on the overall format. The 80-column preview output shows all characters as the same width and height and does not re-

spond to embedded tabs.

An especially nice feature of the 80-column preview is that you can look at any part of your text. Most other word processors that offer an 80-column preview oblige you to preview your text all the way through from the very beginning.

Control

The CTRL and Commodore logo keys access most of the control functions—text modifiers and font selection, block manipulations, find-and-replace, disk commands, 80-column preview, printing, and so on. When you depress one or the other of these keys, the status area at the top of the screen changes to a help screen that doubles as a menu. Because these keys work either shifted or unshifted, you can call up four different menus without having to go through one to get to another.

While holding down these keys to keep the menu visible, you press another key that corresponds to the initial letter of the menu selection you want. This sounds tricky, but in use it's very quick and easy. And because the menus appear along with the CTRL or Commodore logo key, there is rarely any need to look up these commands in the manual. There is a fifth menu for disk functions that you get by pressing CTRL D. This is actually a selection from the unshifted CTRL-key menu, but you get to it so quickly that you soon forget that. All functions may be aborted by pressing the RUN/STOP key.

Format commands are embedded directly in the text, without the benefit of a menu or help screen. You must look them up in the manual or the Quick Reference Guide card until you learn them, but most of them are logical mnemonics and easy to remember.

Text modifier and format commands are visible in the typing mode, which does clutter the screen somewhat. But this is typical of most word processors, although those with "word-wrap" usually seem less cluttered.

Fontmaster II also automatically compensates for changes in pitch, so that compressed, expanded, 10, 12, and 13 cpi all print out perfectly—even when centering or proportional spacing is turned on. And in the typing

Continued on pg. 52

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SOFTWARE REVIEWS

mode, *Fontmaster II* automatically accounts for all text modifier and format commands as soon as you enter them. The tab ruler at the top of the screen skips the text modifier commands.

Memory

The memory available for text is reasonably large—21,576 characters or about 12 double-spaced printed pages. However, it is possible to lock out the memory normally reserved for up to eight of the nine fonts that can be loaded in *Fontmaster II*. This increases the text memory to 36,936 characters or some 21 printed pages.

Another point worth mentioning is that the entire *Fontmaster II* program, including all help information, resides in memory. Therefore, the program disk is needed only when you want to load additional fonts.

Miscellaneous Features

- There is delete-to-right, in addition to the normal delete-key function.
- There is a "soft" hyphen that isn't printed if you reformat your text and the hyphenated word no longer appears at the margin.
- Underlining is visible in the typing mode. Bold, reverse, and underlining all show up as reverse in the 80-column video preview.
- You have your choice of Arabic or Roman page numbering.
- Using the "overlay" command, you can print one character on another. This lets you add diacritical marks to letters in foreign languages, for example, or the "slash" to a zero.
- You can change the key-repeat speed.
- You can change screen, text, and border colors both in the "setup" procedure or any time you're using the word processor.
- You can set a block of text and then change the case of every character in it to either upper-case or lower-case. Or you can underline an entire block.
- Headers and footers are also easy, and there is a full range of commands for positioning them on the page.
- You can chain files together when printing and to create and print form letters with variable blocks.
- And there's a back-up disk included in the box.

Manual

The 80-page manual is clearly written and logically organized, with both a brief tutorial and a reference section. It has a table of contents, an index, and 12 appendices, including a glossary. On the inside and outside back covers are samples of the 33 fonts that come with *Fontmaster II*.

The manual was written by the programmer, Marty Flickenger, which probably explains why it so clear and easy to understand. Just as in designing the *Fontmaster II* program, he has obviously tried to think about the manual from the user's point of view. For example, he has refrained from computer jargon like "toggle" to use "switch" instead. There is also a reference card that shows the most frequently needed information.

Evaluation

When it comes to controlling a dot-matrix printer, there's no doubt that *Fontmaster II* is extremely powerful. For that special ability, it gets five stars—the very best. Considered only as a word processor, it's less spectacular, but nevertheless pretty good. For speed and convenience in use and learning ease, it gets four stars.

As for "transparency"—the amount you are not distracted by the word processor as you are composing text (not copy typing)—*Fontmaster II* gets only three and a half stars. The quick, clean menu/help displays are a real plus. However, the 21-line, 40-column screen, the streaming-text entry, and the format commands can be a distraction.

I should point out here that very few other existing 64 word processors are much better when it comes to transparency. Of the 37 I have evaluated, only one—*Pocket Writer*, formerly *Paperback Writer*—comes close to being truly transparent.

Maybe it's asking too much to want all of those attributes in one word processor right now, but until someone produces one that does everything, *Fontmaster II* is going to be one of the most useful word processors available for the Commodore 64.

Ed. Note: A 128 version of Fontmaster II will be available by mid-summer.

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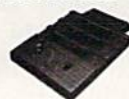
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Publisher: Timeworks

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Medium: Disk

Price: \$69.95

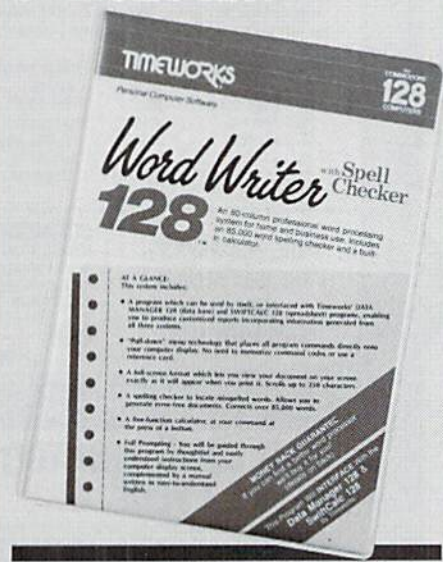
Word Writer 128 is a business-quality word processor for the Commodore 128 that performs well, works with either 40- or 80-column display, includes a spell-checker program, and has all the features you would expect from a good word processor, plus some. Among the unexpected are an on-screen calculator and screen displays that show different typefaces. These features are all packed into an easily mastered word processor which will delight, as well as satisfy, the most demanding writer.

The program is stored on a self-booting disk—all you do is insert the disk and turn on your computer. After the status line appears, you can change the color displays or go right to work. By viewing the program disk directory, you can load a customized printer file which will automatically set the values to properly interface with your printer. If your printer is not among the ones officially supported, a section of the manual gives you step-by-step directions to create a file to match your printer.

If you are the Tolstoy type, you'll like the amount of storage Word Writer 128 provides. You can input up to 25 single-spaced pages into its 64k memory buffer before saving it to disk. Later when your epic is complete, you can link and print up to 9,999 pages! And because it is one of a trio of interactive business programs, you can use it with its sister programs, *Data Manager 128* (data base) and *SwiftCalc 128* (spreadsheet), also from Timeworks.

If you spend a lot of time bent over a keyboard, you'll like the logical editing commands, speed and power of this program. If you use a word processor only occasionally, you'll like the help screen, pull-down menu op-

Word Writer 128 allows you to link and print up to 9,999 pages, and is interactive with Timeworks' Data Manager 128 and SwiftCalc 128.



tions, and built-in printer setups. And if you're a poor speller, you'll fall in love with the spell-checking program.

Standard options like search, search-and-replace, copy, insert, merge, delete, move, headers, footers, and merge files are easily activated. I especially liked Word Writer 128's version of search-and-replace: Search can be for either a word or an entire phrase (both upper and lower case letters can be used) and the replacement can be either a word or phrase. The replacements can be made for all matches or you can selectively pick which to replace and which to leave unchanged.

If you underline a section of text, it will be underlined on the screen. In fact, if an 80-column display is used, you can display text as boldface, italics, underline, superscript and subscript, or a combination of all. For instance, you could have the text display (and your printer print) a bold, underlined italic. When you decide to dump your manuscript to a printer,

the text will be duplicated on paper exactly as it appeared on-screen.

Text is formatted as it is entered, which is why the screen displays exactly how the document will appear when printed. If you change margins within the body of the text, you'll need to manually force a re-format. This can be done as often as you wish, so you can try different and mixed margins until you get the document formatted to suit your needs.

Once chosen, an option can be aborted by pressing the 128's ESC key. You select options by either a pull-down menu or "Quick Commands." Pull-down selection is made by pressing the ESC key to display each option: Help, Functions, Delete, Tab, Print, Disk and Quit. To select one, all you do is highlight the word and press RETURN. But the fastest way is the "Quick Commands." For instance, pressing the Commodore key and "D" puts you in delete mode, while pressing the Commodore key and "P" activates print mode.

New users may prefer the pull-down menus initially, but will adopt the faster "Quick Commands" once they become more comfortable with Word Writer 128. Occasional users will benefit most from the pull-down menus, because there are no commands to memorize. And if you do stumble across a problem, you can always call for help by pressing the HELP key.

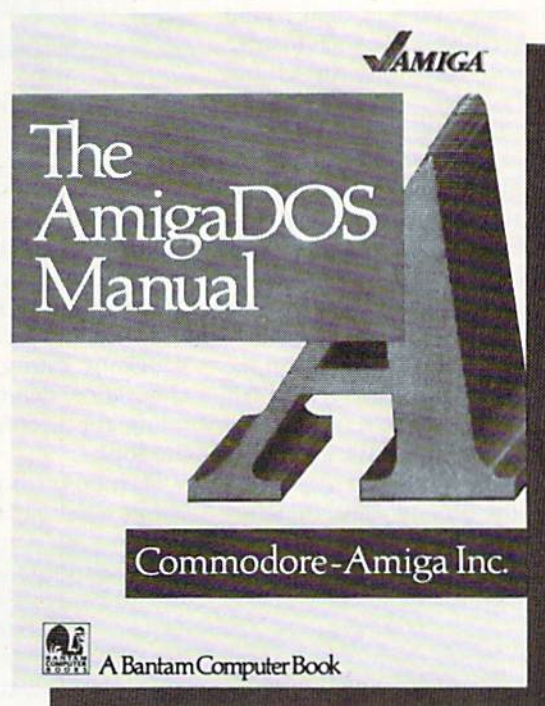
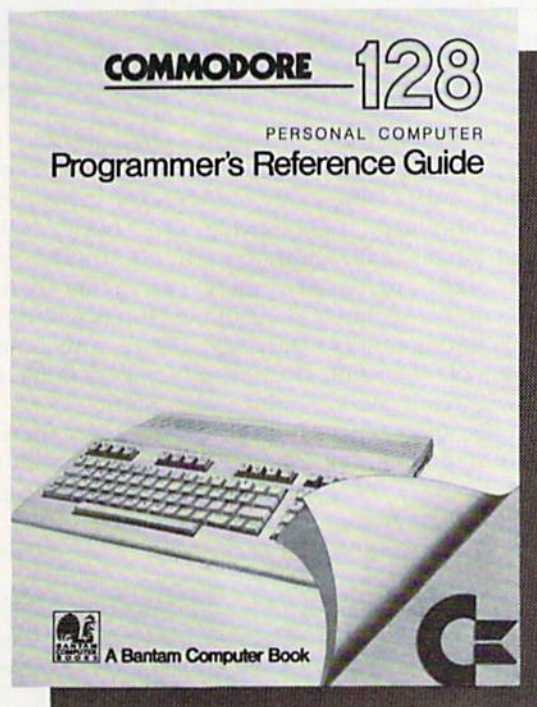
Editing functions include deletes for words, sentences, paragraphs and blocks. The cursor controls make moving around a document fast and easy. You can move space to space, word to word, line to line, page to page or top to bottom of the entire document with a single stroke.

Timeworks guarantees that if you can find a word processor better than Word Writer 128, they'll buy it for you. They also offer a back-up program disk for \$14.70, and if the program is updated, a copy of the upgraded program costs only shipping.

The 85,000-word spell-checker is integrated into the program (an integrated Thesaurus is in the works). To check for spelling errors, you simply select "Check Spelling" from the Functions menu, flip over the pro-

Continued on pg. 122

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Title Bout

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It's late in the fight. You're in the corner with your battered warrior. He's fought valiantly, but the foe is still standing. Before you send him out for the fifteenth and final round, you must give him some final instructions. It's still too close to assume your man's got the victory safely under his belt. Does he need a knockout or merely a good round? Does he have enough points to stay out of trouble in the final round, or has he taken so much already that you want to throw in the towel?

All those decisions are yours in *Title Bout* from Avalon Hill. The board game that *Title Bout* is based on has long been a staple of the Avalon Hill line, but this software rendition has realism few programs have aspired to in the past. Add to this two impressive facts about the boxers: First, there are

Title Bout
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509 boxers on disk, with an additional 115 blanks for creating your own, and, second, the amount of data tabulated on each one is extraordinary.

Each fighter is rated for his ability to control a fight, his ability to cut another fighter or be cut, his technical knockout rating, his hitting power and killer instinct, his knockdown and knockout rating, his aggressiveness, endurance, defense, fouls, and even a rating for keeping his opponent on the ropes.

Each boxer is rated for the number of times he may use a certain strategy

in a fight—strategies like fighting inside, going for the knockout, fighting outside defensively or offensively, covering up. You can also use no strategy. If no strategy is picked, a fighter sticks to his own style, and none of his ratings will be changed in any way. This is a recommended selection when you don't know your fighter very well.

Besides strategy, there is also a choice of attitude. These include all-out attack, aggressive, normal, cautious and all-out retreat. It doesn't

Continued on pg. 123

Title Bout Tourney

The crowd was in a festive mood for the *Title Bout* heavyweight championship at Avalon Hill Arena in Baltimore, Maryland. Today, two defensive stalwarts line up for 15 rounds of explosive action to determine the champion.

In the left corner, from Louisville, Kentucky, Muhammad Ali. Ali defeated three worthy opponents on his way to the finals. He had a lackluster, but solid decision over Jim Braddock, followed by a fifth-round knockout of Ezzard Charles. To get to the finals, he needed a 12-round decision over arch-enemy "Smokin'" Joe Frazier. One judge scored it 116-114 Ali, one a 116-113 win by Ali, and the referee had it 114-114 for a split decision victory.

In the right corner, from Galveston, Texas, Jack Johnson. Johnson had had

an almost impossible route to the finals and won at every step by decision. First it had been ten rounds over Larry Holmes, then ten more over Joe Louis. To get to the finals, he had faced Rocky Marciano. His defense had kept Marciano from hurting him early, and in the eighth round things had begun to favor Johnson. Marciano had developed a cut inside his mouth, and in the ninth he broke his hand. Finally in the last round, Johnson had knocked the Rock down with a straight jab and had taken the decision by scores of 118-110, 118-112, and 116-111.

Early in the bout, Ali spent a lot of time on the ropes where Johnson skillfully scored points. Ali on occasion made some good punches, but in general, gave away the early rounds to Johnson. The middle rounds were even, but Johnson came on again in the ninth and tenth rounds, peppering Ali with surprising ease and quick combinations.

The tide turned quickly in the eleventh when a wicked hook by Ali drove Johnson to the canvas with one minute left in the round. Ali followed it with a great uppercut, but Johnson survived the final 60 seconds without tasting the canvas again.

Ali turned the jab into a lethal weapon in the twelfth and used that punch to put Johnson down with only ten seconds left in the thirteenth round. But Johnson got up and was saved from an Ali follow-up by the bell. Ali narrowly won the fourteenth round, and the final round went to Johnson as he recovered and pushed Ali once again into the ropes.

The first judge scored the fight 143-142 for Johnson, the second 142-141 for Johnson, and the referee 145-142 for Johnson. A unanimous decision! Ali simply gave away too much too early and then couldn't put Johnson away.

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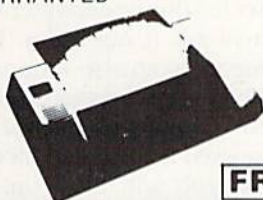
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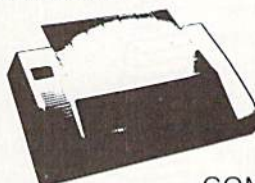


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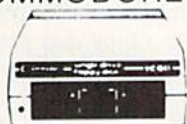
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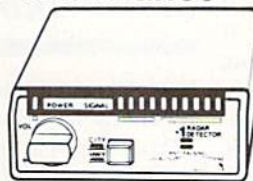


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EA's *Atlantis* Big News for the Amiga

Previews of new entertainment products from the Valley—just released or in development.

This month I'd like to take a close-up look at three new products—two software, one hardware—and then give you a roundup of products in development at press time.

The first is a graphics adventure from **Electronic Arts** for the Amiga. It is called *Return to Atlantis*. In it you play an underwater James Bond-type explorer working for a secret organization. You go through 21 secret missions to get to the ultimate goal: the secret of Atlantis. Along the way you gather clues and items while being pursued by Mr. Big. By the last mission you discover who Mr. Big is and how his organization works.

The game is set in a very high-tech world. You have the use of a submersible flying boat called the Vicroy, and the assistance of Ruff, your underwater robotic friend. Ruff is a robot that looks like a whale. It can be programmed to search for an object in a particular area or path, and whether to search cautiously or aggressively. If it is told to search aggressively, it could be damaged (in an explosion, for example), but if it searches cautiously (for a metal object, for example) it will call you every time it finds a Coke™ can. The action has great 3D perspective. You can get seasick just watching the screen.

At the start of the game you enter your name, sex, and weight to set up your character. (*Return to Atlantis* is one of the first games that takes the sex of the player into consideration.) You are then given your first mission by Argos, your boss, to discover why an underwater city that needs medi-



The Digi-View video digitizer for the Amiga creates high-resolution color pictures that look better than television.

cine on a regular basis has not been receiving its shipments.

You start gathering information by talking to any of five informants that frequent the local bar. They are a belly dancer, a sea captain, an old hag, a Moroccan, and an Arab. Each has his or her own character, and is likely to know the most about things that each deals with. The Moroccan is a trader, and is most likely to know about small baubles and trinkets; the Arab knows about social and political issues; locations or sea lore is the captain's spe-

cialty; the belly dancer overhears tidbits and gossip; and the old hag knows old stories and legends about Atlantis, and is also a friend of the sea captain.

Some of the information you gather may be inaccurate. The informants will respond to you differently if you are a man or woman. They have relationships with each other, but may not trust each other, or you. You can give them money, threaten, cajole, or kill them. They respond as individuals, and use the speech capability of the Amiga. Some of the clues may be about events or locations, others may make no sense at the time, but will relate to future events.

You also have an on-board computer called Art in your underwater boat, and you may ask it questions. From time to time you can also request reports on the progress of each mission. If you have completed the mission itself, but missed an essential element or clue that you will need on later missions, Art may tell you.

This program has been in development for over a year. The missions could be thought of as Saturday afternoon serials. Each adventure is a separate event, but they are all interrelated. Some of the missions are timed. You need to complete each mission, and gather all the clues and artifacts to solve the final mission—the mystery of Atlantis.

Next is an action/strategy game for the 64/128 from **Activision**. It's called *GBA Basketball*, and was produced by Gamestar. It will feature over 40K of animation code and 600 different sprite images. The game design is by Scott Orr and John Cutter, graphics by Steve Chin, programming by Troy Linden, and music by Tommy Dunbar. It is patterned after GBA-style two-on-two play, and uses a unique "league style" of play. You create your own team, including ten players patterned from real life, and join five other teams to become a division. The top two teams in each of four divisions progress to the quarter finals, semi-finals, and world championship play-offs.

GBA Basketball is a two-part game. The first is the "options" mode, where you manage your team. Planning which players to use, checking stats, and designing strategy are all

part of this mode. All player skill levels, stats, and team standings are saved to disk.

The "play" mode allows you to decide if you want to play both players against the computer, have a friend and yourself play against the computer, or try the practice mode. The action is very fast, and remarkably life-like. Check it out.

The hardware I want to tell you about is a video digitizer for the Amiga called **Digi-View**, from the company of the same name. It has unique design: It attaches to the Amiga through the parallel port and uses a monochrome video camera to produce either gray-scale or color images. The color images are created by using color filters over the lens of the camera, and taking multiple exposures. Three exposures are needed to create one color image. The exposure time is about 10 seconds per image, so a color image takes about 30 seconds. The images are displayable in 320 X 200, 640 X 200, or 640 X 400 resolution. Gray-scale resolution is 7 bits, or 128 levels. Color resolution is 21 bits, or 2,097,152 colors, of which 4,096 can be seen on the screen in Hold & Modify mode.

All of the image adjustments are controlled through software. Color balance, brightness, contrast, and sharpness enhancement can all be modified on-screen. Images can be saved as raw data (192K) or as modified IFF files (48K or less). The remarkable thing is the use of the Hold & Modify mode to display the images.

I've seen pictures created using Digi-View, and they look like television. Better in fact. The designer, Tim Jenison, explained that using a monochrome camera allows for the higher resolution of the image. Consumer color cameras use striped image tubes, and some of the image falls between the stripes, reducing resolution. Monochrome cameras are available for around \$200, and the Digi-View will sell for the same price. A very impressive piece of hardware.

In the "soon to be seen" file is a whole host of new items. **Electronic Arts** continues to announce new products by the bushel basket: An upgraded *Deluxe Paint* for the Amiga with print spooling, patterned fills, a lasso brush, double-sized screen,

The Moroccan is a trader; and is most likely to know about small baubles and trinkets; the Arab knows about social and political issues; locations or sea lore is the captain's specialty.

sixth-bit option (luminosity bit), and hard-disk boot option with key disk. *Marble Madness*, *Pinball Construction Set*, *Chessmaster 2000*, *Star Flight*, and an unnamed baseball game, all for the Amiga. *A Time for Heros* by Stewart Smith for the 128. And Tim Leary's *Mind Mirror* for the 64. Also look for *Arctic Fox* for the 64 in time for Christmas.

Already released, and very highly recommended by me, is *Conversations With a Computer*, from **Jenday Software**—a set of games and conversation for the Amiga written in Amiga-BASIC, and shipped with the source code provided. It is entertaining, amusing, thought provoking, and just plain fun. If you have any interest in programming in BASIC on the Amiga, this is a must-have, if only for the examples. Each program is written in modules, and the manual explains the purpose of each module. The programmer, Gil Dodgen, has given his permission to use any of his code modules in your own programs.

VIP Technologies is working on a desktop publishing program for the Amiga to be ready in the third quarter of this year.

Digital Creations has several custom printer drivers for the Amiga, including drivers for the C Itoh 24LPQ, IBM Color Printer, Image Writer I & II, and Toshiba P351 & 1350.

Computer Support Group is selling two audio digitizers for the Amiga—one that connects to a mouse port, with 6kHz resolution, and one

that connects to the printer port with 7.5kHz resolution. Both can digitize samples in excess of ten seconds and are priced under \$50. The company is also producing a video digitizer with a built-in genlock that supports low-, medium-, and high-resolution modes; Hold & Modify, an adapter to allow the use of IBM PC expansion cards on the Amiga; and a RAM expansion unit.

Computer Tech is selling a dual IBM disk drive unit for use on the Amiga. They are also selling clip art disks.

Sierra On-Line plans to release *Winnie the Pooh in the Hundred Acre Wood*, *King's Quest*, *King's Quest II: Romancing the Throne*, *The Black Cauldron*, and *Donald Duck's Playground* on the Amiga.

Electron-General is releasing the Multi-64/128, an expansion card with a RS-232C port, real-time clock calendar with battery back-up, autoboot on power up, and terminal program, all on ROM. This is an industrial-quality product, suited to process control, and also very useful in a BBS setup.

Solid State Software has announced support for the 1750 RAM expansion on the 128. Their *Vizawrite Classic* word processor will recognize a RAM expansion unit and utilize the extra RAM as text storage space. Soon to be added to *Vizawrite Classic* is a graphics font editor. This will allow you to create your own fonts, display them on screen, dump them to a printer, and save them on disk. Also coming is the capability of "sideways" printing for *Vizastar* and *Vizawrite*. Solid State Software's products support the use of the user port as a printer port. This avoids the need for a printer interface, and allows for the standardization of printer drivers in all software. They will be working with other software manufacturers to set a standard for configuring the user port.

Also under development from Solid State are versions of the *Vizastar* spreadsheet/data base and *Vizawrite* for the Amiga. These programs will be able to be co-resident, and will also allow for several text documents or multiple spreadsheets to be resident in memory.

Epyx will release *Winter Games* and the *Temple of Apsbai Trilogy* on the Amiga. An improved version of

SILICON VALLEY INSIDER

The World's Greatest Baseball Game for the 64/128 will also be released. New from Epyx is the *Vorpal Utility Kit* for the 64/128. It includes a disk drive head alignment utility, file recovery utility, fast load utility, and fast format and back-up utilities. Also new for the 64/128 will be the *Movie Monster Game*, an arcade-style adventure where you are the bad guy. You assume the role of the movie monster, a Godzilla-like creature, and win by destroying Tokyo, London, and Paris.

Byte by Byte has released *Financial Plus* for the Amiga. This is a complete business accounting system with general ledger, accounts payable and receivable, payroll, and a word processor.

Activision has purchased **Info-com**. The \$7.5 million purchase will maintain product development and marketing operations in Cambridge, and utilize Activision's distribution channels.

From **KCS**, distributed by Adam, Cobb & King, comes the *KCS Power Cartridge*. Created in Europe, it uses transparent cartridge technology to add a host of features to the 64. The cartridge provides a BASIC programming tool kit with all the standard additions, plus peeks and pokes to double bytes, auto hex-to-decimal function inside other commands, function key definition, trace, and PLIST (LLIST). Full wedge-type commands are included, plus disk and tape turbo commands, and a complete monitor/assembler.

The cartridge also has a "freeze memory" back-up utility that saves the memory of the entire computer and dumps it to disk as a reloadable program. The unique feature of this back-up utility is that programs archived in this fashion will run only if the cartridge is in place. This neatly solves the piracy problem while allowing users to back up protected software. A very nice package, well thought out and quite useful.

Computer System Associates recently released a 68020 board for the Amiga. It is plug-compatible with the 68000 socket on the Amiga's motherboard, and has sockets for the 68881 math co-processor. Talk about turbo: They claim speed improvements of up to 500%.

GBA Basketball for the 64/128 is very fast and remarkably life-like.

A C software development system for the Amiga has been released by **Manx Software Systems**. Several developers I have talked to who have used the product—called *Aztec C68K/Am*—claim it compiles faster, creates smaller code, and runs faster than any other C system they have used on the Amiga. Meanwhile, **MaxiSoft** is alive and well. A new version of *MaxiComm* for the Amiga has been released, and all current registered owners should have received their upgrade by now. The new version is V3.0. A new version of *MaxiDesk* is also out (V1.3). It contains a notepad, full-function calculator (hex and decimal, memory, tape), alarm clock, and appointment calendar (linked to the alarm clock with speech).

MaxiSoft is also developing several new products for the Amiga. The first is *MaxiPlan*, a spreadsheet with data base and charting functions with "hot view" capability. The spreadsheet uses sparse-memory matrix techniques to conserve memory when not all the cells are used. Charts can be saved as IFF-compatible files.

Also close to release from **MaxiSoft** is a mouse macro product code-named *MAX*. Only 5K in size, it records mouse movements and saves them as a file that can be played back. This adds macro functions to any other program. It will have edit and cut-and-paste capabilities.

Finally, another as-yet-unnamed **MaxiSoft** product, code-named *WOW*, is a disk-cache program that stores in memory the most recently used disk files. Think of it as a smart RAM disk. It watches which files you use most, and stores them in RAM. You can set the size of the cache. It uses a write-through technique to keep the file in memory updated. If you use it for no other purpose, it's great for speeding directory calls.

And finally, **True BASIC, Inc.** will release a version of *True BASIC* for

the Amiga. Purists take heart.

Postscript: By now you've seen the Amiga in "Miami Vice," used as a mug shot computer.

That's all for this month. Stay tuned for future developments. C

Manufacturers

Digi-View

701 Jackson B3
Topeka, KS 66604

Jenday Software

POB 4313
Garden Grove, CA 92642

Digital Creations

530 Bercut, Suite F
Sacramento, CA 95827

Computer Support Group

2301 205th Street #106
Torrance, CA 90501

Computer Tech

985 W. Foothill Blvd
Clairmont, CA 91711

Electron General

17981-G Skypark Circle
Irvine, CA 92714

Byte by Byte

3736 Bee Cave Road #3
Austin, TX 78746

Computer System Associates, Inc.

7564 Trade Street
San Diego, CA 92121

Manx Software Systems

POB 55
Shrewsbury, NJ 07701

True Basic, Inc.

39 South Main Street
Hanover, NH 03755

Adam, Cobb & King, Inc.

655 John Muir Drive E411
San Francisco, CA 94132

MaxiSoft

2817 Sloat Road
Pebble Beach, CA 93953

Typewriter 64 *for the Commodore 64* *and 1526 Printer*

People often say that necessity is the mother of invention. Though it is not my place to debate the profound wisdom of this statement, I have also found necessity to be the source of one big headache when it comes to typing. It was my brother Mark, the real computer whiz, who posed the question, "Why don't you make that new 1526 printer work like a typewriter/word processor?"

Well, here it is! Not only will this program let you use your Commodore 64 and 1526 printer as a typewriter, but it also does a few neat tricks that will make the old one-shot paper-slapper hide in the closet where it belongs. The theme of this program bears a similarity to one written by Judy Runge in the June/July, 1984, issue of *Power/Play*. It might be fun to compare the two and then develop your own ideas for writing a program of this nature.

Some of the program's features include:

- Editing up to an entire line using the INST/DEL key.
- Manual or automatic carriage return in case you forget.
- Printing of characters that are available using the Commodore key.
- Holding characters entered during a RETURN and entering them on the next line.
- Printing in reverse type.

When you run the program, a column guide will appear at the top of the screen along with a new cursor. Whenever RETURN is pressed, the typed line is sent to the printer and a new line is started. If allowed to perform an automatic RETURN, the screen will display two lines (which equal one line on the printer) before it dumps to the printer and skips to start a new line. This allows you to keep track of the actual line length.

If you make a mistake, you can erase using the INST/DEL key as far back as the beginning of the line, if necessary. Hitting a CTRL-C at any time will exit the program.

If you have a Commodore 1525 printer, you may have to make this change: 100 OPEN 1,4,8.

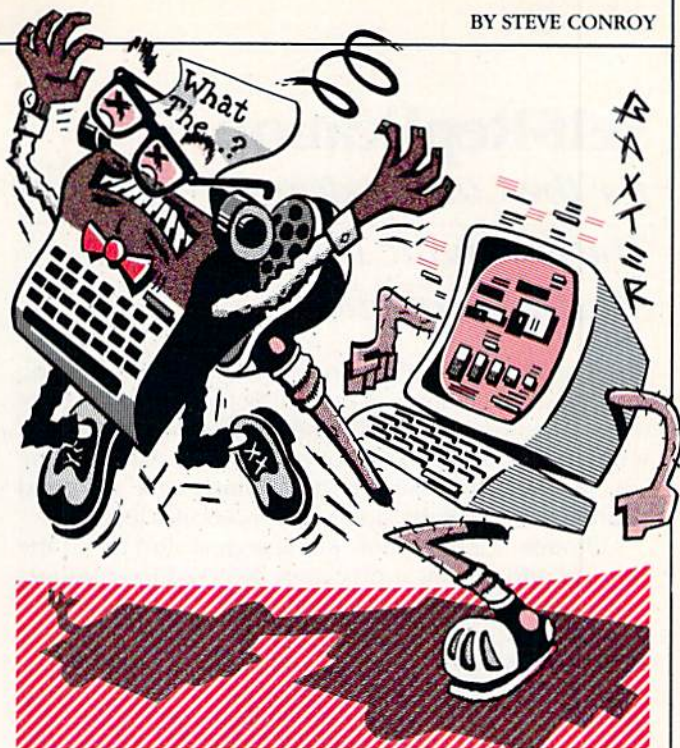
The practical application of this program is obvious, but it also has room for some imaginative modification. For example, try adding the necessary lines to make it print your own personalized heading at the top of each new page. I've seen some expensive typing/word processing programs that are really neat, but I think it's less expensive and more fun to create your own!

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Typewriter 64

```

100 OPEN 1,4,7:BFVV
110 PRINT CHR$(147);CHR$(14);CHR$(8);
    TAB(13)"[RVS,SHFT T,SHFT Y,SHFT P,
    
```



The practical application of this program is obvious, but it also has room for some imaginative modification.

```

SHFT E,SHFT W,SHFT R,SHFT I,
SHFT T,SHFT E,SHFT R] 64[RVOFF]
"FSJM
120 PRINT"[RVS].....10.....20..
    .....30.....40[RVOFF]"BAAF
130 PRINT CHR$(126);:IF (PEEK(211))>0
    THEN POKE 211,(PEEK(211)-1)'JCTI
140 GET C$:IF C$="" GOTO 140'EIED
150 IF C$=CHR$(3)GOTO 230'EINE
160 IF C$=CHR$(13)THEN GOTO 250'FJFF
170 IF ASC(C$)<>20 THEN PRINT C$;
    :SS=SS+C$:GOTO 190'JUXL
180 IF (PEEK(211))>0 THEN PRINT C$;
    'FLTI
190 IF LEN(SS)>78 THEN C$=""
    :GOTO 250'GMEK
200 IF LEN(SS)=0 THEN 220'EIAA
210 IF ASC(C$)=20 THEN SS=MID$(SS,1,
    (LEN(SS)-1))'IWQG
220 GOTO 130'BDDY
230 CLOSE 1:PRINT CHR$(147);CHR$(9);
    CHR$(142)'FRFF
240 END'BACA
250 PRINT " ";C$;:PRINT#1,SS
    :SS=""'DMIF
260 IF PEEK(214)>23 THEN PRINT
    CHR$(147):GOTO 110'HQWJ
270 GOTO 130'BDDE

```

END

Self-Replication for the Commodore 64

The Dramatic Effect of Machine Language

Certainly the single most important characteristic shared by all life forms is the ability to reproduce. Over the past century, biologists and zoologists have studied self-replication at the level of cell division. And over the last 30 years, chemists and biochemists have struggled to understand cell division at the molecular level.

Although scientists now know a great deal about the physical and chemical processes involved in reproduction, there remains much to be discovered. For example, why do most cells divide in a regular, predictable way, while others (cancer cells) duplicate themselves in an uncontrolled and undifferentiated way? Even theoretical mathematicians have played a significant role in this area of research by developing idealized mathematical models of self-replication to compare with experimental observations. An excellent article on this subject can be found in *Scientific American*, Vol. 248, page 22 (1983).

The program described below demonstrates a relatively simple approach to graphical self-replication. This system was first described by Edward Fredkin of MIT. He found that any image represented on a grid by a combination of filled squares and empty squares could be made to undergo four-fold reproduction by a simple rule involving the grid blocks directly above, below, right and left of the block of interest. Thus, as a new generation is produced, each grid block becomes filled if it were previously surrounded by an odd number (one or three) of filled blocks, or it will be left empty if it were previously surrounded by an even number (zero, two, or four) of filled blocks. Let's see how this works.

Repro-Slow

Begin by typing in the first program (REPRO-SLOW) shown below. After saving it, run the program. An image resembling a sideways T appears after a few seconds. Then, after about 30 seconds, the original image is slowly replaced by a second image (or generation), through application of Fredkin's rule. This is followed by a third generation, then a fourth generation, each of which appears more complex than the last but retains the bilateral symmetry of the original image. Finally, the fifth generation results in a completed four-fold reproduction. Four new images, each identical to the original, appear above, below, to the right and left of where the original image once resided.

The process continues, albeit slowly, as long as the program runs. The thirteenth generation has 16 identical images, though not all fit on the screen.

Here is how the program works. A little thought will convince you that we need two areas of memory: the screen memory (locations 1024 to 2047) to show the



This system was first described by Edward Fredkin of MIT, who devised a mathematical model for graphical self-replication.

current generation, and a comparably large block to use during the manipulations to get the new generation. We'll use locations 9176 to 10279, which are well above the BASIC program itself.

Line 10 sets up some parameters, and puts a "1" (white) in each location of screen color memory (locations 55296 to 56319). Line 15 clears the working memory; screen memory was cleared by the CLEAR/HOME instruction in line 10. Line 20 pokes the original image into working memory. You can change this to any image you want by poking a "1" in the appropriate location of working memory. Line 25 pokes the images from working memory into screen memory, block by block. The +96 converts a "0" in working memory to an empty space on the screen (screen character 96), while a "1" is converted to a vertical bar (screen character 97).

Lines 35 and 40 constitute Fredkin's rule. For each location in working memory, its neighbors above, below, to the left and right (all "1"'s or "0"'s) are summed. The "AND 1" decides if the sum is odd or even, and pokes the appropriate result into screen memory. Finally, in line 45 the new screen image is copied back into working memory, and the program returns (line 50) to calculate the next generation.

The only problem is that the various FOR-NEXT loops (lines 10, 15, 25, 35-40, and 45) each require several

JIFFIES/SELF REPLICATION

Even theoretical mathematicians have played a significant role in this area of research by developing idealized mathematical models of self-replication to compare with experimental observations.

seconds to execute in BASIC, so each new generation takes nearly a minute to complete. Isn't there a faster way?

A Faster Way

As you may be aware, machine language is the lowest level computer language. Because the computer doesn't first have to translate the instructions (as it would in the case of a BASIC program), the execution of machine code is over a hundred times faster than execution of a similar BASIC instruction. The disadvantage of machine-language programming is that operations must be broken down into their most simple and fundamental steps. Thus, typical machine-language programs usually appear much longer than comparable BASIC programs.

Begin by typing in the program titled REPRO-FAST at the end of this article. This program is written in BASIC, but is actually what is called a "BASIC loader." It gives the computer instructions for loading machine code, so what you end up with when you run this program is a machine-language program.

Now, try running this version of the program. The sideways "T" appears immediately. Then, each time you press any key, a new generation appears instantly. No longer must you wait a minute or so for each generation (unless you wish to do so). The generation time is determined only by how fast you can hit a key.

Now, go forth and multiply.

Roger Macomber is a Professor of Chemistry at the University of Cincinnati.

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

REPRO-SLOW

```
10 PRINT"[CLEAR]": S=1024: M=9216
   : C=55296: FOR I=0 TO 1023
   : POKE C+I,1: NEXT'KHGK
15 FOR I = 9176 TO 10279 : POKE I,0
   : NEXT'FPSI
20 POKE M+418,1: POKE M+458,1
   : POKE M+498,1: POKE M+459,1
   : POKE M+460,1'KJHL
25 FOR I= 0 TO 1023 : POKE S+I,
   PEEK(M+I)+96 : NEXT'JRDM
```

Continued on pg. 113

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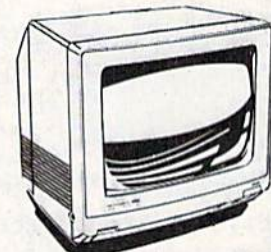
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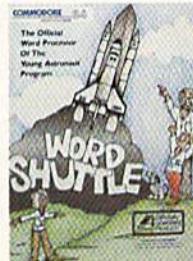
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AUTHORIZED SOFTWARE FOR COMMODORE 64 AND 128

AMIGA TERMINAL SOFTWARE

Two new terminal software packages for the Amiga span the range of user needs—from basic to extremely complex.

BY LOUIS R. WALLACE

Many people use their Amigas to communicate with other computers over the telephone, a task which is known as telecomputing or telecommunications. Telecommunications with a personal computer requires the user's computer to act as a terminal. To achieve that, we rely on a special form of software called a terminal emulator. There are presently two major commercial packages available for the Amiga, with more in development. The two that we looked at are *MaxiComm* from MaxiCorp, and *ONLINE!* from MicroSystems Software.

MaxiComm

MaxiComm is one of several products offered by MaxiCorp of Pebble Beach, California. It is a fairly well equipped terminal emulator, which can be configured in a variety of different ways. It allows you to communicate at 300 to 9600 baud ("baud" refers to the number of signals per second), though most people will not require more than 1200- or 2400-baud speeds. I used it at 1200 baud with no problems.

MaxiComm is controlled by a series of pop-down menus, using a mouse to make menu selections (the function keys can also be used to make selections). There are five menus, titled PROJECT, PHONE, SERIAL, TERMINAL and TRANSFER. Each

menu has several options, some of which have their own submenus.

For instance, the SERIAL menu allows you to set your baud rate, data bits, stop bits, parity and handshaking. (If you don't know what these are, don't worry about it. All you need to do is find out what settings for each of these items are required by the system you wish to talk to, set the menu options and forget about them.) As I mentioned before, 300 to 2400 baud will suffice for most people, but if you are connected directly to another computer via a special cable (not through the phone), 9600 baud will allow you to transfer data at incredible speeds.

The TERMINAL menu offers you additional options that concern the format of the data being sent. You can send or receive with or without linefeeds or carriage returns, accept or ignore tabs, or change your duplex from full to half. This is important because the characteristics of the systems you are communicating with will differ from one to another, and you will find it necessary to alter these settings for each type of system.

The TRANSFER menu is used for file transfers (upload/download). *MaxiComm* allows both straight text capture to a file buffer, and error-free file transfers via a special protocol called XMODEM. Its capture buffer allows only 4K (4,000 bytes), not a very large capacity, so if your data is

coming in faster than it can be written to disk, you may well lose some information.

In cases where data integrity is essential, you will most likely want to use XMODEM, which can send or receive large files without errors. XMODEM will work only when the other system also supports it, but it is one of the more common transfer protocols used today. *MaxiComm* also has a special form of XMODEM transfer protocol for use between two Amigas equipped with *MaxiComm*. It creates the icons necessary for the file to be used from Workbench.

You can create special text files called script files, which can be used to make the terminal program automatically perform a task without your intervention. For example, you could use script files to automatically log on to an information system like QuantumLink or CompuServe. It also allows you to easily program the ten function keys and the calculator keys for your own specific uses. That way, frequently used commands can be sent with one key press.

MaxiComm is copy protected, which means you cannot make backups of the program. (Copy protection is meant to protect the company from loss of profits caused by software piracy.) It also means you cannot transfer it to your hard drive, though it can save the data it collects to the hard drive.



MaxiComm comes equipped with a good manual, which includes a number of actual online transcripts as examples. It is a good product for those people who need reliable, but not too extensive telecommunication software. It retails for \$49.95.

ONLINE!

ONLINE! is a professional-level terminal program for the Amiga. It also makes good use of pop-down menus—eight of them, to be exact. It offers the professional user a wide range of powerful options, while remaining easy to use.

This package has a much wider range of capabilities than commercial terminal packages, regardless of computer type. It emulates VT102, VT100, VT52, ANSI and TTY. With the exception of 132-column mode and smooth scrolling, the emulations seemed to be quite complete. I used it for full-screen editing as a VT100 with our university's VAX system.

The software supports four different error-free file-transfer protocols, and a variable-capacity text buffer (the default is 64K, but can be increased). And it supports transmission rates of 300 to 9600, though I checked it at only 300 and 1200.

ONLINE! also allows you to program the function keys, but there is no provision for defining other keys. In addition, you can create script files, using an extensive language of over

twenty special commands. This gives you the power to create very complex script files for automatic sessions, which can include decision branching based on the input the script receives from the host. For instance, the files can be programmed to wait until a specified time before starting a process, which is very useful on crowded systems where the middle of the night is the best time to try getting on. Just create a script file with the command WAIT.

The program also has a special mode available called "learn." Learn mode allows you to store selected prompts and your replies to create a script of the session. You can then use this as a script file to log on later.

Along with standard XMODEM transfer protocol, *ONLINE!* also supports XMODEM/CRC, HVP (Hayes Verification Protocol, which is SmartComm compatible), and CompuServe B protocol. And, as mentioned, you can download your text to variable-sized buffers from a few K to hundreds of K (of you have that much memory). The only other two file-transfer protocols I would have liked to have seen added are PUNTER, common to Commodore computers, and KERMIT, which is used by many university systems and other institutions. The default text-buffer size is 64K. Text can also be sent to the printer, either from the capture buffer or real time, while it is arriving.

Another very valuable support feature is the use of seven separate translation tables that are user-modifiable. These allow you to customize the ASCII translation to and from all system devices, including the display, printer, keyboard, to and from the capture buffer, and to and from the COM port (communication port). Sometimes a system will require a particular configuration, which you can set up, save and use over and over. This requires a good understanding of ASCII and is one area not extensively covered in what is otherwise a very good manual (over 100 pages long).

ONLINE! is not copy protected. This means you can easily make a backup for your protection, and it will copy to and run fine from a hard drive. Micro-Systems Software is to be praised for not copy protecting the software, and even going a step further in user support by offering updates to registered owners by direct downloading to your computer. The only charge for now is that of the phone call. And since they continue to improve their software, this is an important consideration.

All in all, *ONLINE!* is one of the very best terminal emulators I have worked with. Its features are extensive and powerful yet aimed at making your time spent more efficiently. At \$69.95 it represents a value-packed professional communication system.

The Music Studio

Music Composition for the Amiga

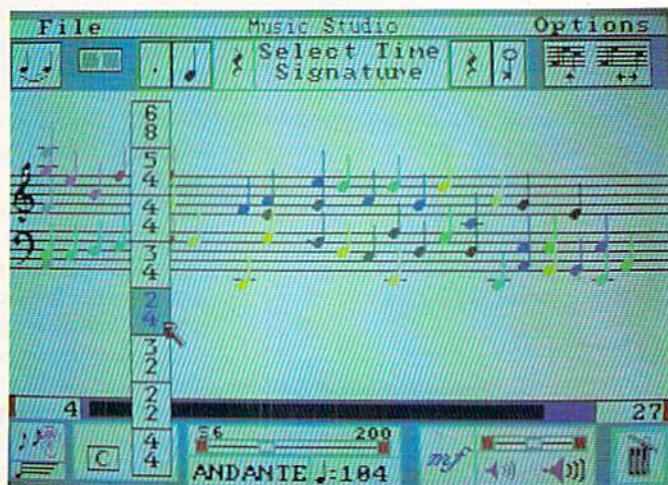
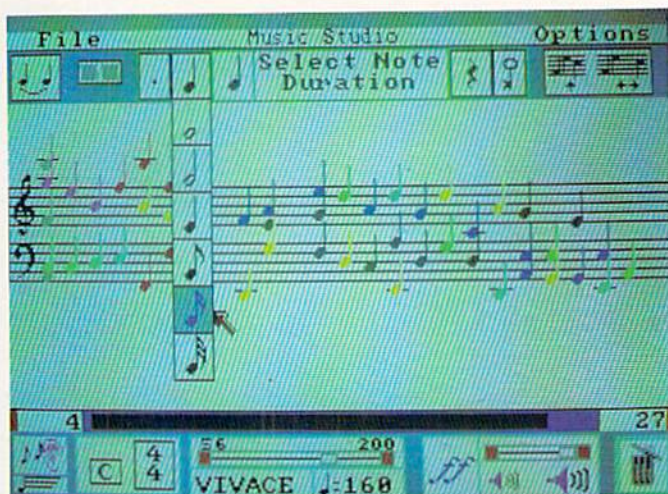
BY MATTHEW LEEDS

Software is often a lot like literature—created by one party and published by another. Yet when it comes to literature, we rarely remember the publisher's name, although most of us can rattle off a list of the authors of our favorite books. I've noticed, however, that in software it's just the opposite. We tend to know the publisher's name much more often than the name of the person or persons who created the software.

Take, for instance, a new music package for the Amiga titled *The Music Studio*, just released by Activision. All that most people would ever know about the origin of that product is that Activision is marketing it. The whole truth is, however, that this very sophisticated music-composition program was created by a small software-design company in Berkeley, California, called Audio Light. So, before we talk about the product, let's take a brief look at its creators.

The Creators

Audio Light is an independent software develop-



Create professional-quality, 16-instrument musical compositions on your Amiga with this brand new product from Activision.

ment company started by Rick Parfitt in 1983. Rick received his Ph.D. in speech recognition, but had always had an interest in computers, so he bought one of the first home computers, an Altair, to teach himself programming. While still in school, Rick met George



White, co-founder of Koala Technologies. George asked Rick to design some applications for a new product he was working on, the KoalaPad touch tablet. Rick contacted a friend, Greg Hospelhorn, and they started work.

The first program produced for Koala by Audio Light was *Dancing Bear* for the VIC 20, an innovative piece of programming based on an animated bear. It allowed you to choreograph dance steps, add backgrounds and music, and design stage settings.

By the time *Dancing Bear* was finished, the Commodore 64 had been released and was beginning to sell well. Koala had contracted with an independent programming company to produce a paint program for the KoalaPad tablet and the 64, but delivery was slow in coming. Audio Light was called in, and the *KoalaPainter* software was written in six weeks. The combination of the KoalaPad tablet and *KoalaPainter* software was a best-seller from the start.

The success of the Koala project led to other pro-

jects for Audio Light: the conversion of *Dancing Bear* to the 64, and the production of *Paint-A-Rhyme*, a Mother Goose coloring book with music for the 64.

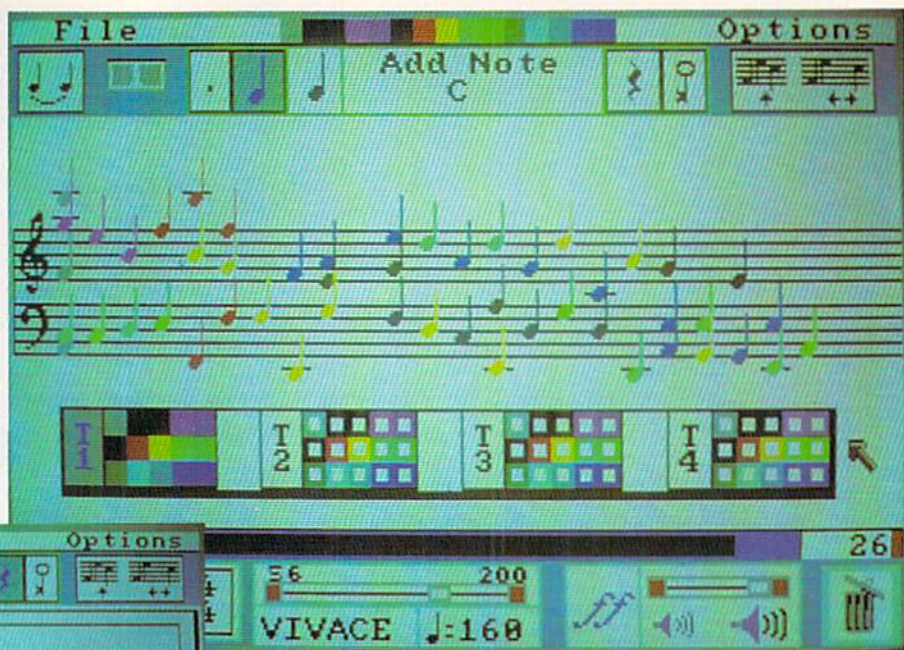
In 1984, at the Consumer Electronics Show in Las Vegas, Audio Light signed a contract with Activision to produce *The Music Studio* for the 64. That program's success prompted Activision to commission the porting of *The Music Studio* to other machines, including the Amiga.

A Professional-Quality Tool

The Amiga version of the program is a professional-quality music-composition tool for the creation of songs and sounds. With it you can compose, edit, play, and save music and lyrics. You can also edit existing instruments and songs, or create your own using the studio instrument-design section. With a compatible MIDI interface and MIDI instruments, you can control keyboards, drum machines, and synthesizers.

The Music Studio is a great deal of fun to use. I'm not

The Music Studio



The creators of The Music Studio also designed the popular KoalaPainter software for Koala Technologies.



a professional musician, but it didn't take me long to begin creating my own music. The most interesting section for me was the Design Instrument section. I spent hours tweaking harmonics and durations, amplitudes and sustains, listening to the differences small changes made, and learning quite a bit about sound theory in the process. The user interface and graphics are very well thought out, and make using *The Music Studio* a joy and not a chore.

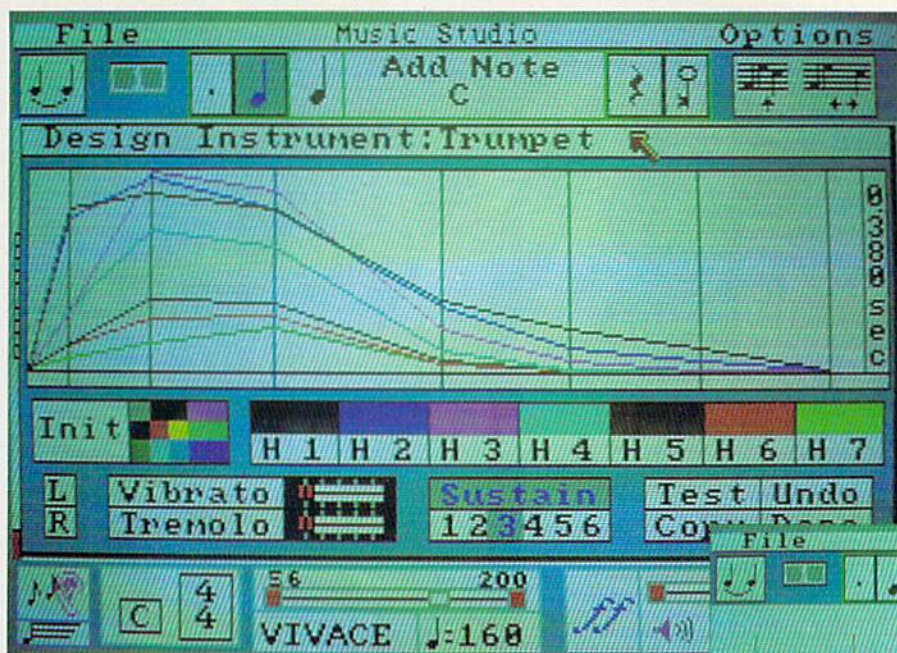
Once you've designed an instrument, it's time to test it out. Clicking on the test box recalculates the sound data for your instrument and plays it on a rising and falling scale. You can select the type of note played (whole to 30-second), or try the instrument out on a pre-selected score. If you don't like what you hear, you can keep adjusting, or just click on the undo box to get your original instrument back. If you like the results, you can save your current song with the new instrument, or save just the new instruments in a sound file. When you're all done, just click on the done box and

you're back in the main composing section.

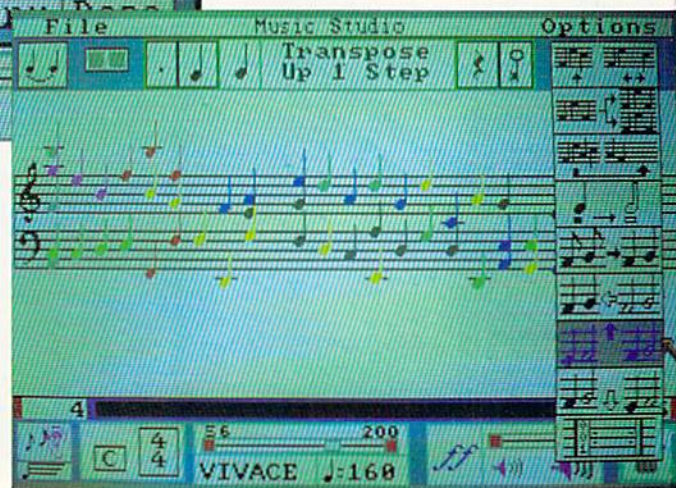
From here you can enter the MIDI parameters section. If you have a MIDI interface and MIDI instrument connected to the Amiga, here is where you will set all the controls for it. MIDI has 16 channels, and there are 16 instrument names available in the MIDI parameter section. You can change the name of any instrument, assign it to any MIDI channel, select any of 80 presets on your MIDI instrument, and set the endpoints of a five-octave range for each instrument. If you don't like the changes you've made, you can click on the undo box. Once you are satisfied with the settings, you can return to the main composing section and save the MIDI settings in a file.

Music Paintbox for Beginners

If all of this seems too complicated for you to start with, a good place to begin using *The Music Studio* is in the Music Paintbox. You don't need to worry about rests or sharps, ties or quarter notes. Here you can



The program is a great deal of fun to use. It didn't take me long to begin creating my own music.



create music by "painting" it on a staff. Each instrument is represented by a different colored box, and five different sized rectangles represent notes from a whole note to a sixteenth note. You use the cursor to paint notes on the staff, moving the cursor across the staff, and clicking wherever you want to place a note. You can edit notes or change the instrument. When you exit the Music Paintbox, your composition will be converted into standard musical notation. You may then save it in a file if you wish. Also, compositions created in the main composing section will be converted to Paintbox compositions if they are already loaded into memory when you enter the Music Paintbox.

The last section to note (no pun intended) is the FILES section. From here you can load or save song or sound files, and append, delete, or rename files. The song and sound file directories can also be examined.

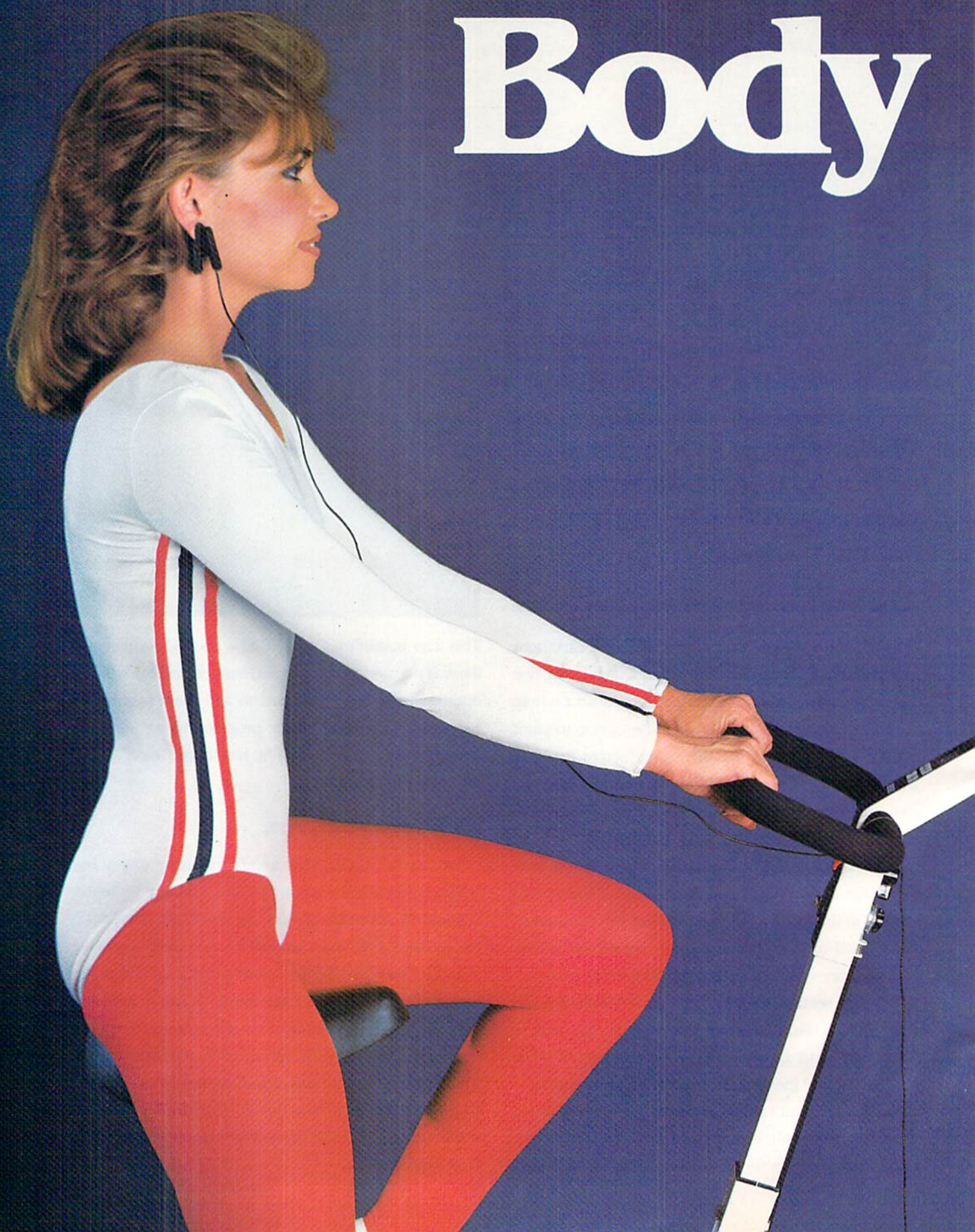
Each instrument's sound is created by a complex set of mathematical algorithms, and any changes to the parameters requires a recalculation of the new sound.

This can sometimes take a few seconds. Currently there is no support for sampled sounds, and no MIDI-in option. Audio Light has plans to add these features to an enhanced version of the program, along with improved editing functions, but it's far too early to be talking about upgrades.

Changing Parameters

On to the tools. The sound envelope graph has seven colored lines along the horizontal axis, representing the seven harmonics, and six black lines along the vertical axis, representing the six time segments available. You can use the cursor to pick up and move any of these lines. The total amount of time available for a single note is just under six seconds, and there is a readout for the time in which each segment occurs. The height of each colored line represents its relative amplitude. There is also a scale that displays the numeric value for each harmonic's amplitude in each time segment.

Body



Language

Biofeedback Comes Home With Bodylink

BY DAN GUTMAN

We put syndicated computer columnist Dan Gutman on a train to Mt. Kisco, New York, to get the scoop on an exciting new peripheral for Commodore computers. Here's his report.

Veins are popping out of my neck. My biceps feel like I've just gone 15 rounds with Rocky Balboa. The steel spring I'm pressing against never gets tired. Keep pressing! The only thing I care about in the world is making this helicopter stay at the top of the screen . . . and avoiding the cloud, the buildings, and the plane flying by.

This is no ordinary computer game. I'm strapped on to Bodylog's new Bodylink™, the multi-purpose peripheral sensation that blew everyone away at the Consumer Electronics Show in January. Bodylink plugs into the cartridge slot of the Commodore 64/128 and turns your computer into an exercise machine, stress reduction device, and all-purpose, at-home, personal computerized biofeedback loop. Is this the ultimate

black box gizmo of the Eighties?

In the Sixties, drugs promised salvation, happiness and bliss. It was a sham. In the Seventies, everyone thought Transcendental Meditation would be the ultimate high. It turned out to be a fake. Now it's the Eighties and we know what *really* delivers true Utopia—computerized biofeedback.

Maybe. Million-dollar biofeedback machines have been lurking in labs and hospitals for 30 years. Now you can stick one in your rec room for a little over a hundred bucks. Bodylink is coming out soon for all home computers. The Commodore version was released first because of its graphics, sound, and five



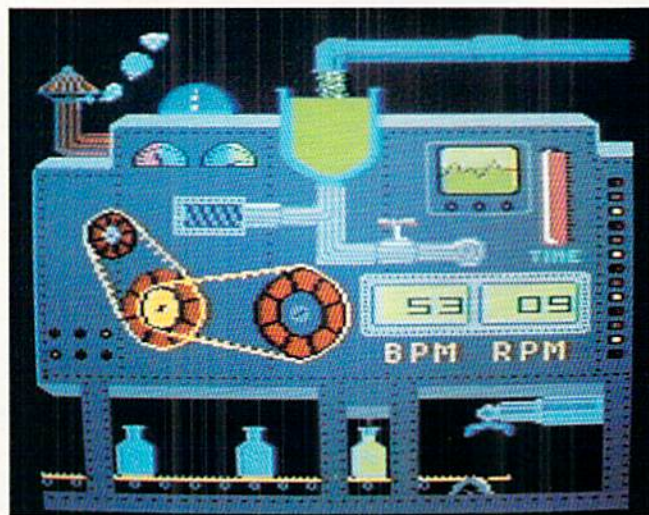
million users worldwide.

If biofeedback is Greek to you, here's the scoop—your body is pumping out invisible signals 24 hours a day. Your heart is beating, your blood pressure is pulsing, your temperature is going up and down, your muscles are firing, you're sweating. You're not even aware of it. Talk about body language! As Bodylog president Jerald Greenberg puts it, "The whole body is a walking transmitter."

Now, these signals aren't just random events. Everything means something. When you're under pressure, your heart will beat faster, you'll sweat more and breathe faster. When you're relaxed, everything slows down. The idea of biofeedback is that *if you can watch these body signals on a screen as they're happening, you can actually control them.* This isn't voodoo, it's science. If you can see a blip on a screen representing your tension level, you can lower it—at will.

Basically, Bodylink transforms the signals from inside your body into something your computer understands (digital information), and your computer then transforms them into something *you* can understand (graphics and sound).

This isn't the first attempt at homebrewed biofeedback. Other hyped products—Synapse's *Relax* and Atari's unreleased *MindLink*—never made it. Bodylink may bomb out, too. The difference is that the other products had just one purpose. Bodylink has many.



Feeling Strong Now

They call it "The Aerobic Factory." They've got me on an exercise bike, with one photo-optic sensor on

Now it's the Eighties and we know what really delivers true Utopia—computerized biofeedback.

the spinning wheel and a clip-on sensor hooked to my earlobe to measure pulse rate. On-screen is the scene inside a bottling plant. The faster I pedal, the faster the assembly line moves. The faster my heart beats, the faster the bottles get filled. I'm pumping the pedals, racing to keep the bottles from overflowing. Whoever said, "No pain, no gain" should be shot.

We live in a health-obsessed society, but when we work out, we don't know precisely how hard we're exercising or how hard we *should* be exercising. Bodylink monitors your heart rate while you, for instance, ride an exercycle. Depending on your age, sex, and fitness level, it determines the heart rate you need to sustain for maximum aerobic gain. At the end of a session, the computer tells you exactly how many calories you burned.

It's simple—if the milk bottles overflow, I'm not peddling hard enough. If the bottles aren't getting filled, I'm peddling too hard. The computer motivates you to work harder if your heart isn't beating fast enough, and helps you slow down if you're pushing yourself.

In other words, when the factory is running well, so is your aorta. "In effect, your heart rate runs the game," claims Greenberg.

The folks at Bodylog have cleverly taken a simple home computer and—for the first time, as far as we know—turned it into a sophisticated exercise machine. Aerobics is only part of it. You can also use your 64 for muscle training. At the beginning of this article, I was straining to keep a helicopter aloft by pushing on a metal-spring device plugged into the computer. This add-on looks something like those "Bullworkers" you see advertised in health and fitness magazines. Bodylog calls theirs COMET™ (Computerized Muscle Exerciser and Trainer).

The harder I pushed, the higher the on-screen helicopter flew. It was a simple isometric exercise, except



that I was getting *feedback* from my muscles. If you don't push (or pull) hard enough, the helicopter crashes. With the COMET-to-Bodylink-to-Commodore combination, you can develop and tone the muscle groups of your stomach, chest, legs and arms. It's more inter-

esting than lifting weights, and it's a lot cheaper than joining a health club.

Put Me In, Coach

"I'm sure you've spent a lot of time coordinating

your eyebrows and your wrist," jokes Bodylog VP Frank Avellanet as he straps one electrode to my arm and another around my forehead. I look like something out of an early Woody Allen movie. I ask for a joystick, instead, and he says, "The joystick is you."

When I close my fist, the cursor moves to the right. When I move my forehead muscles, the cursor moves up. They've got a game rigged up in which you have to move the cursor around the screen to retrieve four colored balls and deposit them in the docking area in the middle. The world record is 17 seconds. No joystick—you use your eyebrows and wrist. You look like Groucho Marx directing a car into a parking space.

Muscle coordination is the key to success in nearly every sport. Dozens of books have been written on the perfect golf swing, the perfect tennis stroke, and the perfect baseball swing. Great athletes have the ability to coordinate their muscles in ways the rest of us can't. Muscle coordination is something we rarely practice, but can easily improve.

Say Dave Winfield is at the plate with two strikes and he's guessing fastball. The pitch comes in and he sees the ball breaking over the outside corner. The great hitter can make that instantaneously slight correction in his swing to hit or foul off a pitch. Winfield is a great hitter.

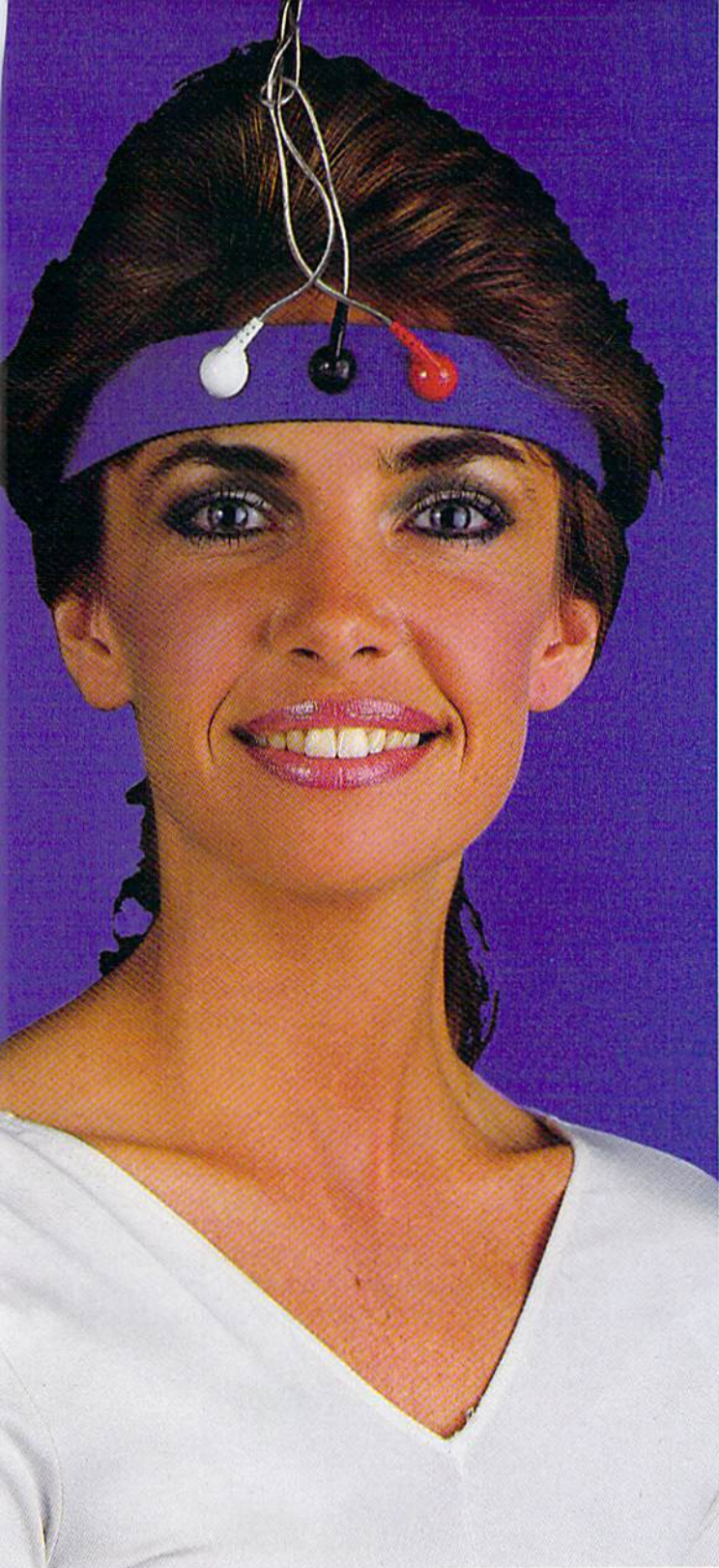
Now imagine you're holding a bat, tennis racquet, or golf club and you've got Bodylink electrodes attached to your wrist. As you're making your swing, the computer can tell you—in real time—whether or not you're doing it correctly. It can tell you if you're breaking your wrists too quickly or swinging too late. This instantaneous feedback can help you make that slight correction just like Winfield makes when the pitch is coming in. For people who don't have Dave Winfield's instincts and reflexes, such information can help them improve their game.

Learning to coordinate forehead and wrist muscles may seem silly, but they show what can be done. Bodylink probes can be attached to any two muscle groups at the same time. The Bodylog people challenged me to a game called 3 Dee Q Bee, sort of a cross between *Marble Madness* and *Q*Bert*. Imagine playing that with your forehead.



Chilling Out

They call this game "Egg Roll." A chicken is at the top of the screen, laying eggs that roll down a ramp. There are holes in the ramp. When I clench my teeth, the top holes are filled in. When I relax them, the bottom holes are filled in. If I do it right, the eggs become chickens. If I don't, they splat on the floor. While I'm trying to do this, "Pop Goes the Weasel" is



playing through the speaker:

Stress is the disease of the decade. Do any of these words raise your blood pressure: MONEY...BOSS...NUCLEAR...CRIME...BO DEREK...DON JOHNSON? You're perfectly normal. Probably the most common application of biofeedback is to reduce stress. Most people can pretty easily manipulate their heart rate if they're watching it on a screen. With Bodylink, a

sensor strapped to your forehead can register muscle tension. As you relax the muscles, the line on the screen dips down.

The average healthy person may have no need for these relaxation techniques, but they may cause a revolution in the medical world. People who suffer from high blood pressure, hypertension, migraine headaches, neuromuscular diseases, and even strokes can use the computer to help themselves at home. In fact, Bodylog thinks one of the biggest markets for Bodylink will be doctors and their patients.

The reason Bodylink may be such a valuable medical tool has a lot to do with the low price of the Commodore 64/128. Million-dollar biofeedback machines couldn't do much for patients because they could only be used at the doctor's office. That's kind of like trying to learn to play the piano when you can only practice at your teacher's house once a week. But now, for a few hundred dollars (you don't even need a disk drive unless you save your data), a patient can do his or her biofeedback exercises any time they want at home. And when you're done lowering your heart rate, you can pop in a computer music program and learn to play piano if you want to.

So here we've got this peripheral that can be used to build your muscles, give you an aerobic workout, improve your coordination, reduce your stress level, and have some fun, too. It really makes you wonder how long people will continue asking that stupid question, "What can I do with a home computer?"

They hand me a temperature probe the size of a matchstick and tell me to hold it lightly between my thumb and first finger. The line on the screen represents my temperature. The higher my skin temperature, the lower my tension. I take a few deep breaths, mentally relax and the line rises slightly. I relax more and the line rises higher. Hey, this feels pretty good! I'm starting to really get into it when a voice tells me, "If you can get it up to here, you'll feel like you're in Nirvana."

Who knows how else we can use Bodylink? ❏

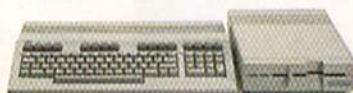
(The basic Bodylink package sells for \$139.95, and add-ons are extra. If you're a programmer, Bodylog is actively seeking developers to create new products for the system. For more information contact Bodylog at 34 Maple Avenue, Armonk, New York 10504.)

HOW TO TO A HIGHER



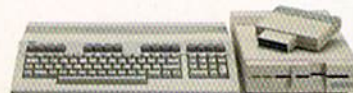
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THE COMMODORE 128 LEARNS TO WRITE.

Looking good in print could be your next move with the MPS 1000 Printer. It's a new dot matrix printer designed to make the most of the 128's high-resolution graphics because sometimes pictures speak louder than words. But it's no slouch when it comes to words. The MPS turns out about 1200 words a minute (100 cps) of draft-quality printing, or gives you near-letter-quality printing at nearly 240 words a minute (20 cps). And you can choose printing styles, use international characters, even make up your own symbols.



THE COMMODORE 128 IMPROVES YOUR VISION.

Brains aren't enough without good looks, so improve your vision with Commodore's new 1902 RGB Color Monitor. The high-resolution screen gives you a sharper image and better color than your standard TV, so you can really appreciate the 128's great graphics. And the 80-column display lets you see more of what you're doing while you're doing it.

All these evolutionary steps ahead won't set you back when it comes to paying for them. Additions to your Commodore 128 are available at a store near you and are as affordable as the 128 itself. We think that's a smart way to help you build a computer system.

COMMODORE 128 PERSONAL COMPUTER
A Higher Intelligence

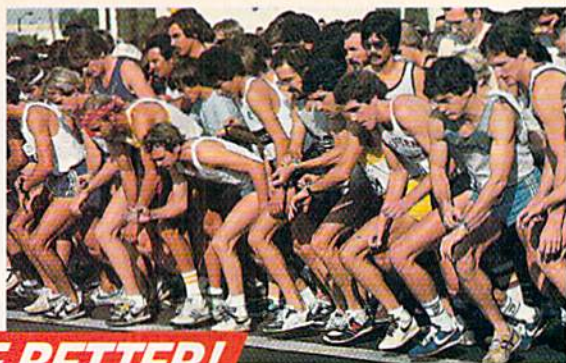
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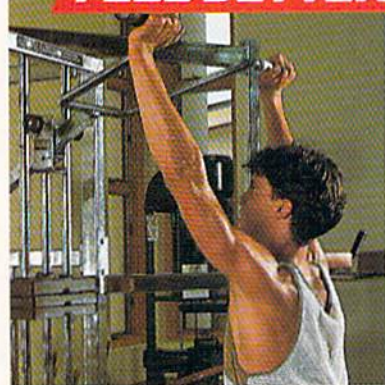
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The Case for Renting Software

An attorney presents his view of why software should be available for rental.

When the 100th Congress convenes come January, 1987, the issue of renting software will again be on the agenda—and this time in a more expanded form than ever before.

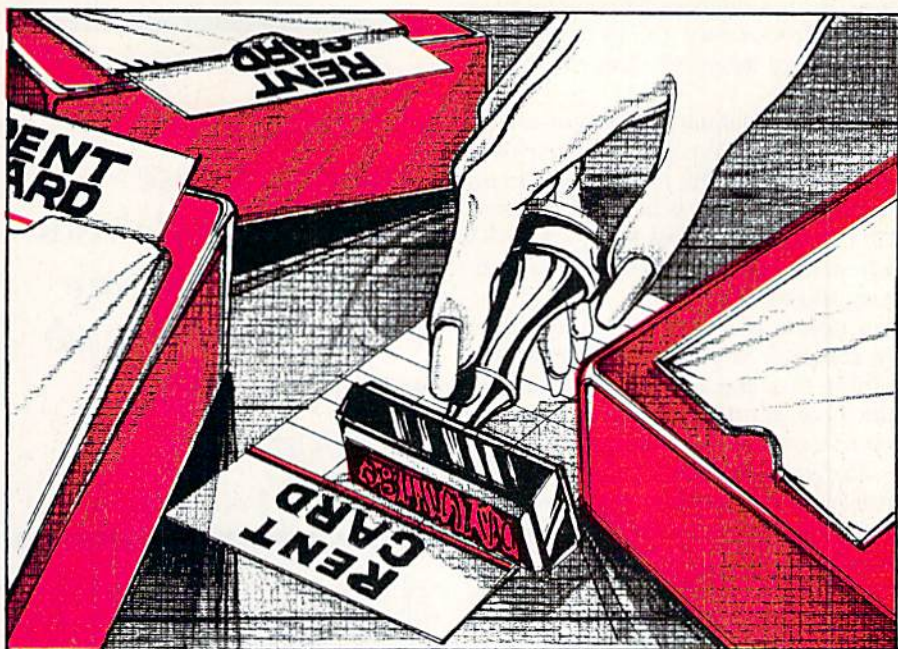
At issue are four questions:

1. Is renting software legal? (Yes.)
2. Is renting software legal the way software is currently marketed? (Probably not.)
3. Is there a case for prohibiting software rental by law? (Definitely.)
4. Is there a case for renting software as a matter of policy? (Very definitely.)

The story begins with passage of the Copyright Act of 1986. Section 109, the so-called "first-sale" doctrine, permits renting of all intellectual property: "... (T)he owner of a particular copy...lawfully made under this title...is entitled, without the authority of the copyright owner, to sell or otherwise dispose of the possession of that copy...."

Translating the legalese—if a person owns a copy of a book, record, videocassette, or software program, he can "dispose" of it: He can rent. Under this section, for example, bookstores and video stores rent. Record stores used to be able to, but no more, for in October, 1984, Congress amended section 109 to exclude record renting for "commercial advantage."

To circumvent the rights granted to "owners" by section 109 of the Copyright Act, many software manufacturers have taken a different tack. Software, they say, is not *sold* to a user; it is *licensed*. The vehicle is the so-called "shrinkwrap license" that appears inside many software pack-



In the 98th Congress, bills were introduced to ban the renting of both records and software. Record renting was banned. Software renting was not.

ages. This license usually states that the buyer, upon opening the package, becomes a licensee (not an owner), which means, among other things, that they have no rights under section 109. Specifically, for our purposes here, this means they cannot dispose of the product by selling, lending—or renting—it.

The software manufacturers' main reason for taking this approach can be summed up in one phrase: fear of piracy. Using this argument, they have been unusually successful, even though many lawyers believe the software retail transaction is not a license but a sale, and that, therefore, section 109 applies. Users continue to abide by the licenses, rarely challenging their validity. And none of the occa-

sional challenges to the shrinkwrap license has ever made it to the courtroom.

Then, in the 98th Congress (1983-84), bills were introduced to take the renting of both records and software out from under the jurisdiction of section 109 of the Copyright Act. Record manufacturers proved their clout, and records were removed. Software was not.

The software companies did not reintroduce the bill in the 99th Congress, for good reason. Congress had asked the Office of Technology Assessment (OTA) to study various copyright issues and report back by December 1985. The manufacturers were waiting for the report, hoping the OTA would suggest banning rentals.

When December came and went without any report, the manufacturers, led by the Association of Data Processing Service Organizations (ADAPSO), decided not to present the bill to the second session of Congress, either, still hoping for a suggested ban from the OTA, which would vastly improve their chances of getting the bill through.

At press time, the OTA report was still not released, but the OTA has gone public on one point: It will not make software recommendations. Therefore, ADAPSO and software manufacturers will be on their own in

Continued on pg. 82

the 100th Congress when they plan to re-introduce the bill to ban rentals of software as an amendment to section 109.

So, come January, software manufacturers will be repeating their two-fold argument. The first part has to do with piracy. As stated by Senator Charles Mathias (R-Md.) in 1983 when he introduced the rental-banning bill for software: "(F)ew observers doubt that the real purpose of (software rentals) is to permit the renter to make a permanent copy of the program for future use—with no compensation to the author."

The second part of the argument has to do with money. If a store rents software, the manufacturer sees no funds, whether the copy is rented once or a hundred times.

This time around, though, ADAPSO and the manufacturers will have a third arrow in their quiver: They have given something in return for what they are asking. They have improved the warranty accompanying software programs. Last spring, in fact, ADAPSO published software "warranty guidelines." This summer the results of those guidelines will begin showing up in software packages.

In effect, ADAPSO and manufacturers were responding to a weakness in their argument. Los Angeles attorney Michael Scott has explained that weakness in a stinging attack in the December, 1984, issue of *Software Protection* (of which he is editor):

"Software vendors are not willing to shoulder the burdens of nonfunctional or inappropriate products. Virtually all software license agreements provide that the software is sold... 'as is' and all warranties are disclaimed. Because of this, a buyer has an increased need to insure that he does not get a product that does not meet his needs, and may even destroy his business. Software vendors are renowned for making exorbitant claims for their software, while not pointing out its limitations. If the buyer must rely solely on the vendor's advertising literature and manuals to determine whether the software will meet his needs, without any opportunity to test the program himself, the buyer is at the mercy of the vendor."

ADAPSO and manufacturers believe they have met the accusations.

Software manufacturers continue to use "shrinkwrap licenses" to prevent software rentals, even though many lawyers question these licenses' validity.

"Henceforth, purchasing software will be different," ADAPSO vice president David Sturtevant says of the new warranty guidelines. "Users will be able to make their selections based on the presence or absence of warranties."

However, Scott had some additional things to say:

"(Rental-banning legislation) fails to recognize the problems currently faced by users in attempting to evaluate software packages before purchasing them....Congress should investigate the current, one-sided nature of the software acquisition process and provide a more even-handed proposal that would protect both vendor... and...user....Such a proposal would prohibit the rental...of software *only if* (emphasis in original) the vendor:

1. Provided an opportunity for the user to evaluate the entire software package before purchasing, or
2. Provided a full refund if the package is found to be unsuitable and is returned within a reasonable time, or
3. Provided realistic warranties and remedies, including the recovery of actual damages, if the vendor misrepresents the capabilities of, or fails to specifically identify the limitations of, the software package."

The case for permitting rental of software gains added cogency by contrasting software with records:

1. Unlike software, records cannot be copy-protected. And, incre-

mentally, the cost of copy-protecting software is not large.

2. People usually have already tried out records—heard them *ad nauseum* in some cases on the radio or at record clubs. This is far different from software, where the user is unaware of what "meets his needs." A sample, in the instance of software, usually doesn't suffice—particularly when a salesman in the store is doing the demonstrating.
3. Demo disks are little better. Too often they are watered down. "Using them," notes Scott, "is like trying to see if you want to buy a Ferrari by buying a Volkswagen. While they both have four wheels, go forward and backwards... there is no way to know if the 'real thing' will meet your needs without 'taking it out for a spin.'"
4. Finally, a record costs little, software a lot. If a record goes wrong, the loss is slight; but with software, not only is the dollar cost large but there may be damage to records and data, as well.

"Software is very special stuff; a person might well want to use it but once. So why have to spend \$400?" asks attorney Julian Millstein of Brown, Raysman & Millstein in New York, editor of *Computer Law Strategist*.

"The case for allowing software rental seems irrefutable to me," he continues. "Piracy is no longer an applicable reason for preventing renting—not when documentation is now half of any program. Ease of duping won't help a pirate that much. Of course, renting should be done with proper notice that there be no copying. But that's no reason to ban it altogether. Everything else in society these days is for rent, so why not software?"

Besides, Millstein concludes, business hasn't been all that good for software recently. "Who knows—maybe renting software would turn out to spur the industry?"

The case for renting software, in short, might just be to help the software industry, despite itself.

Herbert Swartz is an attorney who lives and practices in New York City.

Invisible BASIC Commands

Use this method to keep your programs protected. They'll run, but crucial lines can't be listed.

Here is a technique that will keep your programs from being tampered with. It's somewhat complex, but if you need some security in your programs, it's worth the trouble. The method hides a program line inside your BASIC program. It's there, but it can't be listed for its contents. Along the way, you'll also get a RAM's eye-view of how BASIC programs are stored in memory and handled by list and run commands.

Commodore computers (as well as some others) store program commands and data in RAM in different ways. The BASIC interpreter knows what it is doing and keeps the two forms of information separate and distinct. Here is how it works.

BASIC keywords (like PRINT, POKE) are handled by a method called tokenizing. The keyword PRINT is stored in memory locations as the decimal value 153. Note that each memory location in the machine may contain only one number from 0 to 255. When the CPU is looking for its next byte while executing a program, it treats all values that are greater than 127 as BASIC keywords, as long as they aren't within quotes.

It operates on the values by looking them up in the keyword table, then it jumps to that part of the BASIC interpreter that it finds in the table for the appropriate machine-language routine to execute. This is how the CPU "translates" the commands.

When the CPU finds numbers that are in quotes or are target numbers for GOTO or the like, it considers that information as data. This occurs in literal strings (like "HELLO" and

Using this technique, you could hide a cold-start command, disable the STOP key, or prohibit a LIST or SAVE.

DATA statements). Numbers and letters are stored (one byte per digit or letter) according to their ASCII values. For instance, the statement GOTO 655 requires four bytes of memory for storage: one byte for the GOTO command and one byte each for the three digits.

As a result, the CPU knows what it is looking at any point in time. It knows whether it's looking at a BASIC command or data, and handles each accordingly.

When the CPU is listing a program, it uses a slightly different method. It takes the value that it finds (153 for PRINT) for each keyword and expands it onto the screen using a comparable look-up table. Hence, one decimal value in memory can be transformed into several characters on the screen.

If the CPU is looking inside quotes, it just prints the ASCII equivalent of the value that it finds. This is actually data. Table I shows how the various keywords and data are stored.

How Program Lines are Stored

Let's take a closer look at program storage on the Commodore 64. Turn on your computer and type in the following program line:

```
10 ?"HELLO"
```

After entering the line, type in the immediate mode:

```
FOR I=2048 TO 2063:PRINT I, PEEK(I):NEXT
```

When you press RETURN you'll get a list of the first 16 locations in memory and their corresponding contents. This lets you see what your program line looks like in memory. Table II shows you what you should be looking at on the screen.

Locations 2049 and 2050 point to

the next line of the BASIC program. In this case they point to the end of BASIC text, since our program contains only one line. These two locations can be translated into the target location's decimal value by the following immediate command:

```
PRINT PEEK(2049) + 256 * PEEK(2050) <RETURN>
```

This calculation yields the value of 2062, which is where the next program line would start if it existed. The contents of locations 2051 and 2052 can be similarly translated, yielding the value of the current BASIC line number.

So you can see if you list this line, it will appear to contain 15 different components, one for each number and letter. Actually, in memory, this line contains only 13 components (excluding the first 0 byte and the last two 0 bytes.) You can also see that the pointer in locations 2049 and 2050 point to location 2062. If there were another line in this program higher than line 10, it would start in location 2062. Let's add another line for clarification. Add line 20 to the program:

```
20 PRINT "GOODBYE"
```

Now let's take another look at RAM, but this time we'll look at line 20. Type in the immediate mode:

```
FOR I=2062 TO 2078:PRINT I, PEEK(I):NEXT <RETURN>
```

Table III shows you what you'll see. As you can see, the same pattern is followed as in line 10. The information is different, but the method is the same.

Creating "Invisible" Program Lines

Now you can see that the pointer in line 10 points to the beginning of line 20, and the pointer in line 20 points to the end of BASIC. But suppose we make the lines point differently? This is where the promised "invisible BASIC" comes in. Let's make the first line point not to line 20, but to the end of BASIC text. Type in the immediate mode:

```
POKE 2049, 29 <RETURN>
```

We have made line 10 point to the same place that line 20 points...past line 20 to the end of BASIC text. Now list the program. All you see is line 10! Where did line 20 get to? Well, it's still there, in RAM, but now we're

TECHNICAL TIPS

looking right past it! Want proof that line 20 still exists? Run the program. Here's what you'll see:

```
HELLO
GOODBYE
```

Right? You have proved that line 20 exists, because you can see the results of it! What has happened?

BASIC, while executing a program, doesn't pay any attention to the pointers we've been fiddling with. BASIC just starts at the beginning of the program and executes the statements as it comes up to them. It knows when to expect the next line number because it sees the 0 byte, which indicates the end of the current line number. This is why every line must end with a 0 byte.

Let's recap:

- When listing a program, the CPU uses the pointer bytes to find the beginning of the next line.
- When running a program, the CPU merely fetches the next available program line and tries to execute it, ignoring the pointer.
- Listing doesn't care much if the commands are valid or not. The CPU just "un-compresses" whatever tokens it finds in RAM.
- Running does require testing the commands for syntax, since it must fetch the proper routine to execute the command.

What have we accomplished here? We have inserted a line of BASIC into the program and made it *unlistable*,

but *executable*! Think of the commands that you can hide in this "invisible" line! How about a cold-start command? How about testing a certain memory location for a byte that only you know about, which you can poke there before running the program? How about poking something cute into the operating system vectors, like disabling the STOP key? Or prohibiting a LIST or SAVE?

Remember, the program must be run before this invisible command can be executed. But just think of the possibilities! And you can squeeze the invisible line almost anywhere in the program that you want to. All you have to do is change the line link pointers to look past the invisible line.

Just for fun, let's make the first line of our "HELLO/GOODBYE" program point to *itself*. Type in the immediate mode:

```
POKE 2049,1 <RETURN>
```

Now list the program. WHEEEEEEE! Look at it go! Not much is different. We've just got this thing listing in a circle by making line 10 point to line 10. Another run will reveal that everything is still in RAM and working, as far as execution is concerned.

Now practice this technique and see how many safety valves you can put in your program to keep out uninvited guests.

CAUTION: Be careful editing the program after fiddling with these pointers. You'll drive the CPU bonkers making it look for line numbers that it thinks don't exist! You'll experience all sorts of crashes and screen memory changes if you try to monkey with a program that has already been monkeyed with. (I consider this a little extra security!!)

What About Saving?

This is all well and good, and programs with maladjusted pointers can be saved, but the CPU and operating system get very uncooperative when it comes to loading these programs back into memory. It seems that when loading a BASIC program into RAM, the operating system changes the pointers that we've been fiddling around with, readjusting them to conform with the particular memory configuration of each machine. This is endearingly referred to as the auto-

Table I
How Keywords and Data are Stored

Code (decimal)	Character/Keyword	Code (decimal)	Character/Keyword	Code (decimal)	Character/Keyword	Code (decimal)	Character/Keyword
0	End of line	66	B	133	INPUT	169	STEP
1-31	Unused	67	C	134	DIM	170	+
32	space	68	D	135	READ	171	-
33	!	69	E	136	LET	172	.
34	"	70	F	137	GOTO	173	/
35	#	71	G	138	RUN	174	|
36	\$	72	H	139	IF	175	AND
37	%	73	I	140	RESTORE	176	OR
38	&	74	J	141	GOSUB	177	>
39	'	75	K	142	RETURN	178	=
40	(	76	L	143	REM	179	<
41	)	77	M	144	STOP	180	SGN
42	.	78	N	145	ON	181	INT
43	+	79	O	146	WAIT	182	ABS
44	,	80	P	147	LOAD	183	USR
45	-	81	Q	148	SAVE	184	FRE
46	.	82	R	149	VERIFY	185	POS
47	/	83	S	150	DEF	186	SQR
48	0	84	T	151	POKE	187	RND
49	1	85	U	152	PRINT#	188	LOG
50	2	86	V	153	PRINT	189	EXP
51	3	87	W	154	CONT	190	COS
52	4	88	X	155	LIST	191	SIN
53	5	89	Y	156	CLR	192	TAN
54	6	90	Z	157	CMD	193	ATN
55	7	91	|	158	SYS	194	PEEK
56	8	92	\	159	OPEN	195	LEN
57	9	93	]	160	CLOSE	196	STR\$
58	:	94	↑	161	GET	197	VAL
59	:	95	←	162	NEW	198	ASC
60	<	96-127	Unused	163	TAB(	199	CHR\$
61	=	128	END	164	TO	200	LEFT\$
62	>	129	FOR	165	FN	201	RIGHT\$
63	?	130	NEXT	166	SPC(	202	MID\$
64	@	131	DATA	167	THEN	203-254	Unused
65	A	132	INPUT#	168	NOT	255	π

TECHNICAL TIPS

matic relocation feature of the computer. This feature of the machine makes the "invisible BASIC" difficult to save and reload. It *must*, however, be overcome if this technique is to be of any value.

So here we go, another complication has crept in to spoil our fun. But fear not! There is a way to save and reload "invisible BASIC" from tape and disk! Here is how it goes.

Up until now we have been entering programs and looking at the normal start of BASIC area of memory (2049 on the 64). This starting point

is established by the operating system when the CPU is powered up. But, remember, we are smarter than the CPU sometimes, and we can change this starting point if we want to. Furthermore, we must do this if we expect our "invisible BASIC" to save and load. Reset the CPU (SYS64738) and get ready to learn something else about your computer.

Nothing is really free. Any time you want something extra, you're going to pay for it sooner or later. And so it is with "invisible BASIC." The price you must pay is in the form of a little extra

RAM. It will cost you a little more memory to do this, but isn't it worth it? This is the general format:

1. Move up the start of BASIC.
2. Load the program to be secured.
3. Make the changes desired.
4. Move back the start of BASIC.
5. Save the program to tape or disk.
6. Turn off the CPU.

In detailing each of these steps, I'll make the commands as generic as possible so I won't have to show all the values for all possible memory configurations. After you go through this exercise a few times, you can shorten the commands to suit your particular needs.

Step 1: Memory locations 43 and 44 contain the pointers to the start of BASIC. We need to change these pointers by moving the start of BASIC to some point higher up in memory. Let's make it easy on ourselves and only move it up two pages.

Type in the immediate mode:

```
POKE 44,PEEK(44)+2: POKE
256*PEEK(44),0:NEW
```

This will move the start of BASIC 512 bytes (two pages) higher up in memory. You can move it higher up if you want to, but two is an easy number to remember (I have two computers, that's how I remember.) The second poke puts a zero in the first location of BASIC memory, a requirement of the operating system.

Step 2: A simple load will do here, since the system will adjust your pointers for you. Just load the program that you're going to fix.

Step 3: Make the changes you want to the program. Inspect RAM carefully and make the pointer changes necessary to create your "invisible BASIC" line or lines. BE CAREFUL!!! Depending on the current start of BASIC, you will need to change the values used in the first part of the article. As long as you know the location of the start of BASIC... (PRINT(PEEK(43)+256*PEEK(44)))... you can easily adjust the values, letting the computer do the math for you.

Step 4: Now move the start of BASIC back to its power-up value. POKE44,(PEEK(44)-2) will move it back two pages, assuming that's how far up you moved it.

Step 5: Save the program using the non-relocating save. Here's how:

```
SAVE"program name",1,1 for tape
```

Table II. Contents of Memory, Line 10

Memory Location	Contents	Description
2048	0	First byte of BASIC program area. Must contain 0
2049	14	Two-byte pointer to next line of BASIC (points to 2062)
2050	8 (or 18 or 16)	
2051	10	Low byte of this line #
2052	0	High byte of this line #
2053	153	Token for PRINT
2054	34	Quote mark
2055	72	Letter H
2056	69	Letter E
2057	76	Letter L
2058	76	Letter L
2059	79	Letter O
2060	34	Quote mark
2061	0	Line Limiter (end of this line)
2062	0	Two 0 bytes indicating the end of the BASIC program
2063	0	

Table III. Contents of Memory, Line 20

Memory Location	Contents	Description
2062	29	Pointer
2063	18	Pointer
2064	20	Line #
2065	0	Line #
2066	153	PRINT
2067	34	Quote mark
2068	71	Letter G
2069	79	Letter O
2070	79	Letter O
2071	68	Letter D
2072	66	Letter B
2073	89	Letter Y
2074	69	Letter E
2075	34	Quote mark
2076	0	Line limiter
2077	0	End of BASIC text
2078	0	End of BASIC text

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SAVE "program name", 8 for disk
This save method flags the program (tape only) so that it will never load into any area of memory except from whence it was saved, using either a normal load command or a LOAD "name", 1, 1. No pointers get changed. No relocating takes place. At this time you may verify your program.

VERIFY "PROGRAM NAME", 1, 1

Step 6: Turn off the CPU. This is the easiest way to make sure that you dump all of the residual program material and get all of the pointers straightened out.

Your program is now secure (assuming that nothing went wrong). Anyone who tries to load this program will neither produce a listing nor facilitate a run. This is true of a normal load as well as a LOAD "name", 1, 1.

But wait a minute! How will you load it??? Easy! Load it normally, then change the pointers for the start of BASIC so that it's in the same configuration as it was when you saved the program. If you had saved the pro-

gram when the start of BASIC pointers were set for page ten, then type POKE 44, 10 and everything will be fine. You can list or run, and your "invisible BASIC" lines will still be invisible to listing.

In the case of our current example, type:

LOAD "program name", 1, 1

<RETURN> or

LOAD "program name", 8

<RETURN>

then type

POKE 44, 10 <RETURN>

Now everything is OK and your program is secure. Don't forget to set up whatever conditions your program may be testing for, assuming that's what your "invisible BASIC" will be doing.

The best way to keep from having to remember where BASIC starts for each program would be to include the start of BASIC pointers in the program name when you save it. For example,

SAVE "HELLO-1/10", 1, 1

indicates the values to be poked into

locations 43 and 44 (1 and 10 respectively.) You can have different programs load into different places to keep life from getting boooooing!!!

Summary

Remember, you can put these "invisible" lines just about anywhere you want in your program, just be careful! It would be to your advantage to put your security line or lines early in the program. This will keep your GOTO's and GOSUB's as honest as possible. And realize that under some conditions you'll have to reverse the security from within the program to get the program to run at all, depending on what commands you're hiding.

It is worthy of note here that you cannot make the first line of a long program point to the end of BASIC. Some funny things happen. Maybe it has something to do with pointing past too many pages of memory. In any event, be careful, and make sure you keep a working copy of the program for back-up until you are sure that all of the wrinkles are ironed out.

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Game Design

Part 3: Using Graphics Screens

This is the third in a series of articles that explain some of the in's and out's of programming your own games. Part 1 appeared in *Commodore Power/Play* October/November, 1985, and Part 2 appeared in *February/March*, 1986.

Most people agree that the Commodore 64 can produce some of the best color graphics of any home computer. But getting the most color and graphics from your 64 can be a tedious programming task, unless you have some good utilities.

To get the most out of the 64's graphics, you need graphics software and either a touchpad or a light pen. With these tools you can produce very detailed screens without having to worry about which POKEs to make and which memory locations hold which bytes.

However, even though you can create terrific graphics using these packages, their manuals usually don't supply the information you need to transfer your graphic creations into your own programs. Without this information, it's very tough to use your designs in a game.

In this article, we will try to rectify that problem for users of two popular graphics packages for the Commodore 64: *KoalaPainter* (used with the KoalaPad touchpad), and *Micro Illustrator*. We'll take a look at how picture files are organized in each of these packages, explain how to use the files in your programs, and supply some short utility programs to help you use them more easily.

File Structures

The structure of a *KoalaPainter* picture file is simple. Each picture consists of exactly 10,001 bytes of information. Of these, the first 8,000 bytes are the actual picture. The next 1,000 are bytes used for color. These color bytes have to be transferred to the screen area starting at memory

Use these utilities to read KoalaPainter and Micro Illustrator graphics screens into your own programs.

location 1024. The next 1,000 bytes are also used for color. These have to be transferred to 55296 through 56295 to fill up color RAM. The last byte is the background color. Table 1 shows the structure of a *KoalaPainter* picture file.

Micro Illustrator, however, has a different file structure. The load address is at 6364. And although you can display a high-res screen in the first 16K block of the 64's memory it is not advisable, because your BASIC program could easily overwrite your design. Because of this, the *Micro Illustrator* display programs transfer the high-res data to the same area as *KoalaPainter*.

The first two bytes of *Micro Illustrator* files are the background and border color, respectively. The next 18 bytes are unused. The color bytes are located from 6484 to 7383. The 1,000 color nybbles follow immediately and the 8,000 picture bytes follow that. Use Table 2 for reference.

Machine Language

Doing all this transferring can be tedious in BASIC. Machine language is obviously the language of choice for an application of this sort. Program 1 is a BASIC loader for use with *KoalaPainter*. It will first POKE the machine-language program into high memory starting at 49152 then SYS to the entry point and allow you to view a picture file without *KoalaPainter*.

Program 5 is a BASIC loader that works with *Micro Illustrator* files. It, like Program 1, POKEs the machine language from the data statements and SYSes to the start address.

To use Program 1, just load a *KoalaPainter* picture file into your computer using the "comma 8 comma 1"

method. (For *Micro Illustrator* files use Program 5 and follow the same instructions.) When the READY prompt appears, type NEW and load in Program 1 or Program 5. When you get the READY prompt again, type RUN, and after a brief pause you should see your high-res picture. You can incorporate the appropriate routine—Program 1 or Program 5—into your own BASIC programs without ever having to worry about how the machine language works.

Saving Object Code

Programs 1 and 5 are called BASIC loaders because they are in BASIC and they load a machine language program into memory by poking it from data statements. Some people prefer having their machine language routines in this form because it gives them more flexibility. A BASIC loader can be easily added to an existing program. However, others prefer having the machine language in the form of an object file. An object file is a program that you load using the "comma 8 comma 1" method. This kind of program does not require that any data be poked into memory, and is therefore faster to use. You just SYS to its starting address and you get immediate results.

Programs 2 and 6 allow you to save the machine-language program to disk as an object file. You must first load and run Program 1 (for *KoalaPainter*) or 5 (for *Micro Illustrator*) and tap the RUN/STOP-RESTORE keys when you see the high-res screen. Type NEW. Next load Program 2 if you're using *KoalaPainter*, or Program 6 if you're using *Micro Illustrator*. Place the disk to which you would like the object code saved in the drive then run the program. When the red light goes off on the disk drive, you will have a program file called "DISPLAY.OBJ." You can now load this file with a "comma 8 comma 1" and type SYS 49152 to see a *KoalaPainter* or *Micro Illustrator* picture.

To get a perfectly clean high-res picture, you'll need to use Program 3 (for *KoalaPainter*) or Program 7 (for *Micro Illustrator*). This is because you need to call the routine from a program so the READY prompt does

COMPUTER TUTOR/GAME DESIGN

not interfere with the picture. Program 3 or 7 will do the trick for you.

BASIC Demos

Programs 4 (for *KoalaPainter*) and 8 (for *Micro Illustrator*) are demo programs. These demonstrate why it is impractical to use BASIC for the picture files. The procedure needed to see a picture file is not very involved. It's just a matter of setting a couple of registers and transferring a few thousand bytes of data. These programs were written first in BASIC to work out the logic for the machine-language versions.

Moving Sprites

Once you discover how powerful this routine can be, you will inevitably be tempted to use a high-resolution screen for a game. If you decide to do so, you must remember that all sprite data and sprite pointers must

Table 1: KoalaPainter File Structure

24576	Load Address
24576-32575	Picture Bytes
32576-33575	Color Bytes
33576-34575	Color Nybbles
34576	Background Color

Table 2: Micro Illustrator File Structure

6364	Load Address
6364	Background Color
6365	Border Color
6366- 6383	Unused
6384- 7383	Color Bytes
7384- 7483	Color Nybbles
8384-16383	Picture Bytes

be moved.

Since the high-res screen is in the second 16K block of the 64's memory and the VIC II chip can see only one

16K block of memory at a time, it is necessary to store all sprite data starting at memory location 16384. If, for example, you wanted to have a sprite in your game, you would just place the 63 bytes of sprite data starting at 16384 and then place a 0 in the corresponding sprite pointer. The sprite pointers, however, are not at the usual memory locations 2040 to 2047. The pointers are now located between 24576 and 24583 (at the top left of the high-res image).

To use more than one sprite, just set the appropriate pointer and store the data. For the second sprite you just set 24577 with a 1 and store the data starting at memory location 16428. Even with a high-res image there is still enough room left over for a total of 96 different sprite images. This should be more than enough for a lot of very exciting and graphically detailed games.

Before typing these programs, read "How to Enter Programs," and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Program 1. KoalaPainter BASIC Loader

```

100 FOR X= 49152 TO 49266'DLMY
110 READ A:POKE X,A:NEXT X
    :SYS 49152'ENDB
120 GOTO 120'BDCX
130 DATA 169,147,32,210,255,169,2,
    141'BDND
140 DATA 0,221,169,120,141,24,208,
    173'BDXE
150 DATA 17,208,9,32,141,17,208,
    173'BBMF
160 DATA 22,208,9,16,141,22,208,
    162'BBEG
170 DATA 215,160,0,132,33,134,34,
    162'BCTH
180 DATA 131,160,40,132,251,134,252,
    230'BFIJ
190 DATA 34,160,0,177,251,145,33,
    200'BCXJ
200 DATA 208,249,232,224,135,208,238,
    162'BGKC
210 DATA 126,160,64,132,251,134,252,
    162'BEWD
220 DATA 91,160,0,132,253,134,254,
    162'BDCE
230 DATA 4,160,0,132,33,134,34,
    230'BAPE
240 DATA 252,230,254,177,251,145,33,
    145'BFFG
250 DATA 253,200,208,247,232,224,8,
    208'BEBH
260 DATA 236,173,16,135,141,32,208,
    141'BEYI
270 DATA 33,208,96'BJXF
    
```

(END)

Program 2. KoalaPainter Object Creator

```

10 OPEN 2,8,2,"DISPLAY.OBJ,P,W"BGKC
20 PRINT#2,CHR$(0);:PRINT#2,CHR$(192);
    'EPBD
30 FOR X=49152 TO 49266'DLMD
40 PRINT#2,CHR$(PEEK(X));:NEXT X'EKYE
50 CLOSE 2'BBJB
    
```

(END)

Program 3. KoalaPainter Object Loader

```

10 IF A=0 THEN A=1:LOAD"DISPLAY.OBJ",
    8,1'FJXF
20 SYS 49152'BFMY
30 GOTO 30'BCKY
    
```

(END)

Program 4. KoalaPainter BASIC Demo

```

10 PRINT CHR$(147):POKE 56576,2
    :POKE 53272,120'EXCE
20 X=PEEK (34576):POKE 53280,X
    :POKE 53281,X'EYMF
30 POKE 53265,PEEK (53265)OR 2^5'EPOE
40 POKE 53270,PEEK (53270)OR 2^4'EPFF
50 FOR X= 0 TO 999'DFKE
60 POKE X+55296,PEEK (X+33576)'EPLH
70 POKE X+1024,PEEK (X+32576)'EORI
80 POKE X+23552,PEEK (X+32576)
    :NEXT'FQHK
90 GOTO 90'BCQF
    
```

(END)

Program 5. Micro Illustrator BASIC Loader

```

100 FOR X= 49152 TO 49301'DLCY
110 READ A:POKE X,A:NEXT X
    :SYS 49152'ENDB
120 GOTO 120'BDCX
130 DATA 169,147,32,210,255,169,2,
    141'BDND
140 DATA 0,221,169,120,141,24,208,
    173'BDXE
    
```

GAME DESIGN

```

150 DATA 17,208,9,32,141,17,208,
    173'BBMF
160 DATA 22,208,9,16,141,22,208,
    173'BBGG
170 DATA 220,24,141,33,208,173,221,
    24'BDUH
180 DATA 141,32,208,162,95,160,0,
    132'BCAI
190 DATA 33,134,34,162,32,160,192,
    132'BDBJ
200 DATA 251,134,252,230,34,160,0,
    177'BDAB
210 DATA 251,145,33,200,208,249,232,
    224'BFWD
220 DATA 64,208,238,162,23,160,240,
    132'BEZE
230 DATA 251,134,252,162,91,160,0,
    132'BDXE
240 DATA 253,134,254,162,4,160,0,
    132'BCXF
250 DATA 33,134,34,230,252,230,254,
    177'BEZH
260 DATA 251,145,33,145,253,200,208,
    247'BFAI
270 DATA 232,224,8,208,236,162,215,
    160'BEBJ
280 DATA 0,132,33,134,34,162,28,
    160'BBXJ
290 DATA 216,132,251,134,252,230,34,
    160'BFPL
300 DATA 0,177,251,145,33,200,208,
    249'BDHC
310 DATA 232,224,32,208,238,96'BVCC (END)

```

Program 6. Micro Illustrator Object Creator

```

10 OPEN 2,8,2,"DISPLAY.OBJ",P,W"BGKC
20 PRINT#2,CHR$(0);:PRINT#2,CHR$(192);
    'EPBD
30 FOR X=49152 TO 49301'DLCD
40 PRINT#2,CHR$(PEEK(X));:NEXT X'EKYE
50 CLOSE 2'BBJB (END)

```

Program 7. Micro Illustrator Object Loader

```

10 IF A=0 THEN A=1:LOAD"DISPLAY.OBJ",
    8,1'FJXF
20 SYS 49152'BFMY
30 GOTO 30'BCKY (END)

```

Program 8. Micro Illustrator BASIC Demo

```

10 PRINT CHR$(147):POKE 53280,
    PEEK(6365):POKE 53281,
    PEEK(6364)'GGZH
20 POKE 56576,2:POKE 53272,120'CRXC
30 POKE 53265,PEEK(53265)OR 2^5'EPOE
40 POKE 53270,PEEK(53270)OR 2^4'EPFF
50 FOR X=0 TO 999:POKE X+55296,
    PEEK(X+7384)'HUEJ
60 POKE X+1024,PEEK(X+6384)'ENRH
70 POKE X+23552,PEEK(X+6384)
    :NEXT'FPHJ
80 FOR X=0 TO 7999:POKE X+24576,
    PEEK(X+8384):NEXT'IWON
90 GOTO 90'BCQF (END)

```

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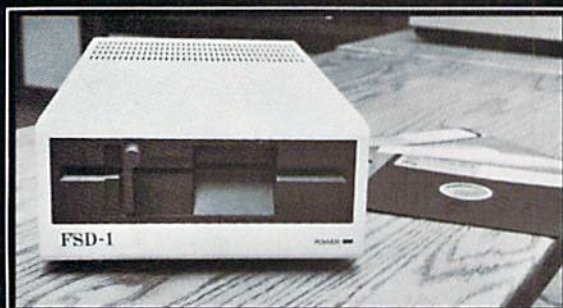
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Equestrian64

"Equestrian64" is an arcade-type video game for the Commodore 64. A joystick, plugged into port 2, is required.

After typing the program into memory, save it on a disk or tape before running it. This is very important because once the BASIC program is executed, it cannot be saved. The program pokes a machine-language program into memory at location 49152 to 52034.

Starting off with five horses, your objective is to jump over as many mushrooms as you can. Pressing the fire button will cause the horse to jump.

Killer bees will try to hinder your mushroom jumping. Positioning the joystick upwards will shoot an arrow which will kill a bee, but not a mushroom. You will lose a horse each time it collides with a mushroom or a bee.

There are six stages to the game. Each succeeding stage is more difficult than the last. Advancing to the next stage is accomplished by jumping over 15 mushrooms. Every mushroom jumped and each bee killed will add points to your score. The number of points you receive increases as you advance through the stages.

Pressing the keys 1 through 9 during the introduction music will change the game's speed. The lower the key pressed, the faster the horse runs. The default speed is 5.

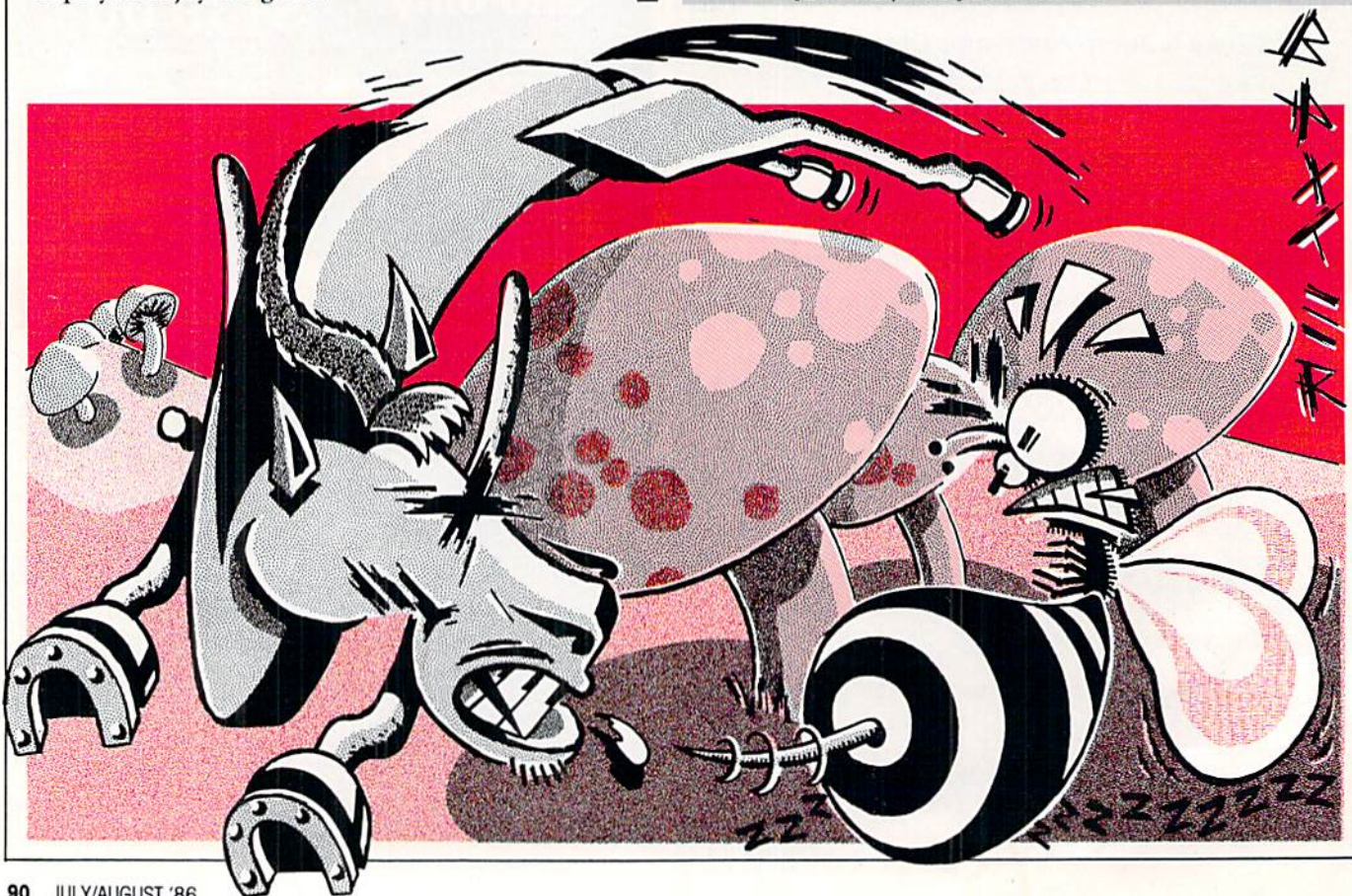
That's all you have to know to play Equestrian64. I hope you enjoy the game.

Starting with five horses, your objective is to jump as many mushrooms as you can. But killer bees will try to hinder you.

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Equestrian64

```
1000 PRINT "[CLEAR,DOWN3]" 'BAUT
1010 AS="EQUESTRIAN64" 'BCQX
1020 GOSUB 1140 'BEHV
1030 AS="POKING MACHINE LANGUAGE
PROGRAM" 'BCVF
1040 GOSUB 1140 'BEHX
1050 AS="PLEASE WAIT ABOUT 30
SECONDS" 'BCNG
1060 GOSUB 1140 'BEHA
1070 FOR T=0 TO 2883 'DGWD
1080 READ X 'BBWB
1085 IF X<0 OR X>255 THEN PRINT "
[DOWN2,RVS]ERROR IN
```



GAME PROGRAMS/EQUESTRIAN 64

```

LINE"INT(T/8)*10+1180:END'LRGU
1090 POKE 49152+T,X'CIEF
1100 S=S+X'CDOV
1110 NEXT'BAEU
1120 IF S=307896 THEN SYS 49152'EMBB
1130 PRINT"?CHECK SUM ERROR":END'CBNC
1140 L=LEN(A$)'CFSA
1150 T=20-INT(L/2)'EHRD
1160 PRINT TAB(T)"[DOWN]";A$'CFEC
1170 RETURN'BAQB
1180 DATA 169,130,133,251,169,200,133,
252'BGXI
1190 DATA 169,0,133,253,169,48,133,
254'BDUI
1200 DATA 162,3,160,0,177,251,145,
253'BCFA
1210 DATA 200,208,249,230,252,230,254,
202'BGPC
1220 DATA 208,240,169,11,141,32,208,
169'BEED
1230 DATA 7,141,216,199,169,0,141,
33'BBOD
1240 DATA 208,141,29,208,169,200,141,
249'BFHF
1250 DATA 7,141,253,7,141,250,7,
141'BADF
1260 DATA 254,7,169,13,141,251,7,
162'BBNG
1270 DATA 8,189,231,198,157,37,208,
202'BDDH
1280 DATA 16,247,169,65,160,199,32,
30'BCYI
1290 DATA 171,169,0,162,63,157,64,
3'BAQJ
1300 DATA 202,16,250,162,23,157,0,
212'BCSB
1310 DATA 202,16,250,162,3,157,212,
199'BDIC
1320 DATA 202,16,250,141,210,199,141,
218'BFTE
1330 DATA 199,169,4,141,8,212,169,
180'BCBE
1340 DATA 141,7,212,169,255,141,96,
3'BBPF
1350 DATA 169,2,141,93,3,141,99,3'BXXF
1360 DATA 169,4,141,102,3,141,90,
3'BYZH
1370 DATA 169,15,141,24,212,169,17,
141'BDKI
1380 DATA 5,212,141,12,212,169,160,
141'BDTJ
1390 DATA 19,212,169,128,141,6,212,
141'BDGK
1400 DATA 13,212,169,243,141,20,212,
169'BEWD
1410 DATA 31,141,21,208,169,119,141,
28'BDHD
1420 DATA 208,169,5,141,211,199,169,
160'BEQF
1430 DATA 141,219,199,169,5,133,252,
169'BEXG
1440 DATA 104,133,251,32,233,192,169,
12'BEXH
1450 DATA 141,219,199,169,217,133,252,
169'BGYI
1460 DATA 104,133,251,32,233,192,76,
6'BCHI
1470 DATA 193,162,15,160,39,173,219,
199'BEWK
1480 DATA 145,251,136,16,251,165,251,
24'BECL
1490 DATA 105,40,133,251,165,252,105,
0'BDSL
1500 DATA 133,252,202,16,230,96,169,
101'BEYE
1510 DATA 141,0,208,141,3,208,141,
11'BBNE
1520 DATA 208,141,5,208,141,13,208,
169'BDIF
1530 DATA 102,141,1,208,169,0,141,
6'BAUG
1540 DATA 208,141,7,208,169,64,141,
16'BCPH
1550 DATA 208,169,160,141,10,208,169,
85'BEMJ
1560 DATA 141,12,208,169,255,141,9,
208'BDNJ
1570 DATA 141,8,208,141,2,208,169,
0'BAFK
1580 DATA 162,14,157,221,199,202,16,
250'BECM
1590 DATA 141,11,212,141,18,212,141,
4'BCLM
1600 DATA 212,169,54,141,4,208,169,
192'BDTE
1610 DATA 141,248,7,173,30,208,32,
149'BCNF
1620 DATA 198,173,30,208,162,39,160,
16'BDSG
1630 DATA 136,208,253,173,0,220,41,
16'BCAH
1640 DATA 240,249,202,208,241,173,74,
200'BFWJ
1650 DATA 141,1,212,173,93,200,141,
0'BBNJ
1660 DATA 212,32,159,255,32,228,255,
201'BECL
1670 DATA 49,144,9,201,58,176,5,
233'BAVL
1680 DATA 46,141,216,199,173,0,220,
41'BCHM
1690 DATA 16,208,3,32,254,193,173,
0'BAHN
1700 DATA 220,41,15,73,15,208,6,
32'BYBF
1710 DATA 185,193,76,148,193,201,1,
208'BDVG
1720 DATA 246,169,1,141,224,199,76,
167'BDAL
1730 DATA 193,238,229,199,173,229,199,
201'BGIJ
1740 DATA 4,208,31,169,0,141,229,
199'BBRJ
1750 DATA 169,33,141,4,212,238,235,
199'BDUK
1760 DATA 173,235,199,201,7,208,5,

```

GAME PROGRAMS/EQUESTRIAN 64

169'BCYL	2090 DATA 199,173,7,208,24,125,237,
1770 DATA 0,141,235,199,24,105,192,	199'BDDJ
141'BDGM	2100 DATA 141,7,208,173,7,208,201,
1780 DATA 248,7,32,78,194,173,229,	112'BCBA
199'BCQN	2110 DATA 144,17,169,0,141,18,212,
1790 DATA 201,2,240,5,169,0,141,4'BXYN	141'BCCB
1800 DATA 212,96,162,255,172,216,199,	2120 DATA 224,199,141,228,199,141,6,
136'BFUH	208'BETD
1810 DATA 208,253,202,208,247,96,169,	2130 DATA 141,7,208,96,173,16,208,
199'BFDI	61'BBSD
1820 DATA 141,248,7,162,0,142,222,	2140 DATA 194,199,208,36,189,202,199,
199'BCLI	168'BFOF
1830 DATA 32,164,196,206,1,208,32,	2150 DATA 185,0,208,24,233,0,153,
78'BBQJ	0'BYWF
1840 DATA 194,32,78,194,32,78,194,	2160 DATA 208,185,0,208,208,16,173,
174'BCMK	16'BCMG
1850 DATA 222,199,232,224,11,208,230,	2170 DATA 208,29,194,199,141,16,208,
169'BFEM	169'BEBI
1860 DATA 0,141,4,212,32,78,194,	2180 DATA 112,153,0,208,56,96,24,
32'BYDM	96'BARI
1870 DATA 78,194,162,11,142,222,199,	2190 DATA 189,202,199,168,185,0,208,
238'BESO	24'BDCJ
1880 DATA 1,208,32,78,194,32,78,	2200 DATA 233,0,153,0,208,16,17,
194'BABO	189'BAHB
1890 DATA 32,78,194,174,222,199,202,	2210 DATA 194,199,73,255,141,219,199,
208'BESQ	173'BFJD
1900 DATA 235,173,74,200,141,1,212,	2220 DATA 16,208,45,219,199,141,16,
173'BDXH	208'BDVD
1910 DATA 93,200,141,0,212,96,162,	2230 DATA 24,96,173,221,199,201,0,
1'BAWI	240'BCIE
1920 DATA 32,252,194,144,3,32,53,	2240 DATA 54,201,1,240,98,173,252,
197'BBPJ	7'BAKF
1930 DATA 162,2,32,252,194,144,3,	2250 DATA 201,202,208,8,169,201,141,
32'BADK	252'BESH
1940 DATA 53,197,162,5,32,252,194,	2260 DATA 7,76,103,195,238,252,7,
144'BCTL	162'BBWH
1950 DATA 3,32,53,197,162,6,32,	2270 DATA 4,32,252,194,176,14,173,
252'BYLM	210'BCII
1960 DATA 194,144,3,32,53,197,173,	2280 DATA 199,201,4,144,17,162,4,
210'BCNN	32'BAIJ
1970 DATA 199,201,2,144,16,173,223,	2290 DATA 252,194,144,10,169,0,141,
199'BDSO	221'BDBK
1980 DATA 240,3,32,255,196,173,223,	2300 DATA 199,169,0,141,11,212,96,
199'BDUP	169'BCWC
1990 DATA 208,3,32,74,195,173,0,	2310 DATA 1,141,227,199,141,221,199,
220'BAGQ	32'BDND
2000 DATA 41,15,73,15,201,1,208,5'BXDX	2320 DATA 222,255,141,217,199,173,16,
2010 DATA 169,1,141,224,199,32,169,	208'BFMF
194'BDBA	2330 DATA 9,16,141,16,208,169,112,
2020 DATA 32,203,195,32,150,197,76,	141'BCIF
242'BDPB	2340 DATA 8,208,169,101,141,9,208,
2030 DATA 193,173,224,199,240,77,173,	169'BCUG
228'BFAD	2350 DATA 201,141,252,7,169,4,141,
2040 DATA 199,208,26,169,100,141,6,	8'BAGH
208'BDRD	2360 DATA 212,169,180,141,7,212,96,
2050 DATA 173,1,208,141,7,208,169,	238'BDRI
11'BBIE	2370 DATA 227,199,173,227,199,205,217,
2060 DATA 141,231,199,169,0,141,236,	199'BGLK
199'BEQG	2380 DATA 208,196,169,2,141,221,199,
2070 DATA 169,1,141,228,199,238,6,	32'BDUK
208'BCBG	2390 DATA 198,196,96,173,30,208,141,
2080 DATA 238,236,199,32,204,196,174,	219'BEYM
236'BFYI	2400 DATA 199,162,17,173,219,199,41,

GAME PROGRAMS/EQUESTRIAN 64

```

127' BEBE
2410 DATA 93,140,199,240,4,202,16,
243' BCJE
2420 DATA 96,138,10,170,189,158,199,
133' BECG
2430 DATA 251,189,159,199,133,252,108,
251' BGWH
2440 DATA 0,206,211,199,104,104,104,
104' BEKI
2450 DATA 104,104,173,211,199,48,28,
32' BDMI
2460 DATA 5,196,76,6,193,160,23,
162' BAVJ
2470 DATA 2,24,32,240,255,169,5,
32' BYGK
2480 DATA 210,255,173,211,199,24,105,
48' BEGM
2490 DATA 76,210,255,162,5,160,15,
24' BBGM
2500 DATA 32,240,255,169,80,160,196,
32' BDQE
2510 DATA 30,171,169,0,141,4,212,
141' BBTF
2520 DATA 11,212,141,18,212,162,39,
160' BDVG
2530 DATA 16,136,208,253,173,0,220,
41' BCAA
2540 DATA 16,240,249,202,208,241,173,
0' BDBI
2550 DATA 220,41,16,208,249,76,34,
192' BCQJ
2560 DATA 156,71,65,77,69,32,79,
86' BYTK
2570 DATA 69,82,0,173,223,199,240,
1' BAQL
2580 DATA 96,169,0,141,221,199,141,
224' BDQM
2590 DATA 199,141,228,199,141,6,208,
141' BERO
2600 DATA 7,208,141,233,199,141,231,
199' BEOG
2610 DATA 141,232,199,141,11,212,141,
18' BETH
2620 DATA 212,169,255,141,8,208,141,
9' BCPH
2630 DATA 208,238,223,199,173,210,199,
56' BFYJ
2640 DATA 233,2,48,15,10,168,185,
21' BAIJ
2650 DATA 199,133,251,185,22,199,133,
252' BFSL
2660 DATA 76,86,198,96,238,230,199,
173' BDTM
2670 DATA 230,199,201,5,208,6,169,
0' BALM
2680 DATA 141,230,199,96,189,74,200,
141' BEPO
2690 DATA 1,212,189,93,200,141,0,
212' BBTO
2700 DATA 169,33,141,4,212,96,169,
33' BBTG
2710 DATA 141,11,212,96,238,234,199,
173' BENI
2720 DATA 234,199,201,4,240,1,96,
174' BBOI
2730 DATA 231,199,169,0,141,234,199,
224' BEQK
2740 DATA 0,208,4,142,18,212,96,
206' BAFK
2750 DATA 231,199,174,231,199,189,74,
200' BFYM
2760 DATA 141,15,212,189,93,200,141,
14' BDBM
2770 DATA 212,169,129,141,18,212,96,
238' BEOO
2780 DATA 232,199,173,232,199,201,5,
240' BEKP
2790 DATA 1,96,238,233,199,169,0,
141' BBXP
2800 DATA 232,199,173,233,199,201,8,
208' BESI
2810 DATA 9,169,0,141,223,199,141,
11' BBKI
2820 DATA 212,96,170,189,112,200,141,
8' BDHJ
2830 DATA 212,189,121,200,141,7,212,
169' BEWL
2840 DATA 33,141,11,212,96,173,210,
199' BDIL
2850 DATA 201,1,240,13,201,2,240,
9' BYJM
2860 DATA 201,5,240,64,201,3,240,
42' BAON
2870 DATA 96,142,219,199,32,222,255,
174' BEVP
2880 DATA 219,199,201,127,144,18,189,
194' BFAQ
2890 DATA 199,73,255,141,219,199,173,
29' BEIR
2900 DATA 208,45,219,199,141,29,208,
96' BDDJ
2910 DATA 173,29,208,29,194,199,141,
29' BDEK
2920 DATA 208,96,173,29,208,201,102,
208' BEGL
2930 DATA 1,96,173,29,208,29,194,
199' BBML
2940 DATA 141,29,208,96,173,21,208,
201' BDKM
2950 DATA 127,208,1,96,173,21,208,
29' BBQN
2960 DATA 194,199,141,21,208,96,162,
3' BCWO
2970 DATA 142,226,199,189,206,197,170,
173' BGCQ
2980 DATA 21,208,61,194,199,240,25,
173' BDSQ
2990 DATA 16,208,61,194,199,208,17,
189' BDES
3000 DATA 202,199,168,185,0,208,201,
75' BDSA
3010 DATA 208,6,32,23,198,32,71,
198' BAWB
3020 DATA 174,226,199,202,16,210,173,
218' BFID
3030 DATA 199,201,15,240,5,96,1,2' BXOC

```

GAME PROGRAMS/EQUESTRIAN 64

```

3040 DATA 5,6,169,0,141,218,199,
    32'BYRE
3050 DATA 26,198,238,210,199,173,210,
    199'BFAG
3060 DATA 201,6,208,31,169,0,141,
    210'BBSG
3070 DATA 199,141,29,208,169,255,141,
    9'BDAL
3080 DATA 208,238,211,199,173,211,199,
    201'BGMJ
3090 DATA 10,144,5,169,9,141,211,
    199'BBOJ
3100 DATA 32,5,196,76,6,198,24,
    160'BYAB
3110 DATA 23,162,0,32,240,255,173,
    210'BCTC
3120 DATA 199,24,105,49,76,210,255,
    238'BDBD
3130 DATA 218,199,24,169,5,32,210,
    255'BCUE
3140 DATA 160,37,162,0,32,240,255,
    173'BCDF
3150 DATA 218,199,201,10,176,12,105,
    48'BDKG
3160 DATA 72,169,32,32,210,255,104,
    76'BCLH
3170 DATA 210,255,169,49,32,210,255,
    173'BEIJ
3180 DATA 218,199,105,38,76,210,255,
    173'BETK
3190 DATA 210,199,10,168,185,11,199,
    133'BENL
3200 DATA 251,185,12,199,133,252,24,
    160'BEGD
3210 DATA 6,162,0,32,240,255,248,
    160'BBED
3220 DATA 3,24,185,212,199,113,251,
    153'BDKE
3230 DATA 212,199,136,16,245,216,160,
    0'BDJF
3240 DATA 140,219,199,185,212,199,72,
    74'BECH
3250 DATA 74,74,74,24,105,48,32,
    210'BAMH
3260 DATA 255,104,41,15,24,105,48,
    32'BBCI
3270 DATA 210,255,238,219,199,172,219,
    199'BGEK
3280 DATA 192,4,208,223,96,162,0,
    189'BBUK
3290 DATA 240,198,48,74,168,185,74,
    200'BDAM
3300 DATA 141,1,212,185,93,200,141,
    0'BBQD
3310 DATA 212,185,81,200,141,8,212,
    185'BDEE
3320 DATA 100,200,141,7,212,169,33,
    141'BDPF
3330 DATA 4,212,169,33,141,11,212,
    189'BCFG
3340 DATA 254,198,141,219,199,142,220,
    199'BGAI
3350 DATA 162,47,160,31,136,208,253,
    202'BEYJ
3360 DATA 208,248,206,219,199,208,241,
    174'BGVK
3370 DATA 220,199,232,169,0,141,4,
    212'BCEK
3380 DATA 141,11,212,76,151,198,96,
    7'BBSL
3390 DATA 1,10,2,2,4,5,2,2'BQVK
3400 DATA 4,11,4,9,4,7,4,5'BQQC
3410 DATA 7,9,7,5,4,255,50,50'BTTE
3420 DATA 25,50,50,100,25,25,25,
    25'BYVG
3430 DATA 25,25,100,29,199,33,199,
    37'BBAH
3440 DATA 199,41,199,45,199,49,199,
    53'BCEI
3450 DATA 199,57,199,61,199,0,0,1'BXEJ
3460 DATA 0,0,0,2,0,0,0,3'BPJI
3470 DATA 0,0,0,5,0,0,0,16'BQOJ
3480 DATA 0,0,0,16,0,0,0,37'BRRK
3490 DATA 0,0,0,80,0,0,0,117'BSPL
3500 DATA 0,147,156,83,67,79,82,
    69'BYNF
3510 DATA 32,5,48,48,48,48,48,48'BWQF
3520 DATA 48,48,32,32,32,156,83,
    84'BYXH
3530 DATA 65,71,69,32,5,49,32,32'BWBH
3540 DATA 32,156,77,85,83,72,82,
    79'BYOJ
3550 DATA 79,77,83,32,5,32,48,13'BWGJ
3560 DATA 17,156,32,32,32,32,32,
    32'BYZL
3570 DATA 32,32,32,32,32,32,32,32'BXWL
3580 DATA 32,32,72,79,82,83,69,83'BXJN
3590 DATA 32,5,53,0,3,5,17,24'BTEN
3600 DATA 28,26,19,21,81,65,49,33'BXCF
3610 DATA 85,83,51,53,88,56,241,
    195'BAJH
3620 DATA 241,195,241,195,91,196,91,
    196'BEEJ
3630 DATA 91,196,241,195,241,195,241,
    195'BFXK
3640 DATA 241,195,241,195,241,195,241,
    195'BGRL
3650 DATA 241,195,241,195,241,195,91,
    196'BFXM
3660 DATA 91,196,1,2,4,8,16,32'BUQL
3670 DATA 64,128,0,2,4,6,8,10'BTHM
3680 DATA 12,14,0,4,0,0,0,0'BRMM
3690 DATA 2,12,0,31,1,0,0,0'BRKN
3700 DATA 0,0,0,0,0,0,0,0'BPEF
3710 DATA 0,0,0,0,0,255,0,255'BTPH
3720 DATA 0,255,0,255,0,255,0,0'BVWI
3730 DATA 0,255,0,0,0,0,255,0'BTPJ
3740 DATA 0,0,1,0,0,0,1,0'BPGJ
3750 DATA 0,0,1,0,0,0,1,0'BPGK
3760 DATA 0,0,1,0,0,0,1,0'BPGL
3770 DATA 0,0,1,0,0,1,0,0'BPGM
3780 DATA 1,0,0,1,0,0,1,0'BPHN
3790 DATA 0,1,0,0,1,0,0,1'BPHO
3800 DATA 0,1,0,0,1,0,1,0'BPHG
3810 DATA 1,0,1,1,1,1,1,1'BPLH
3820 DATA 1,1,1,1,1,1,1,1'BPMI

```

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```

3830 DATA 1,1,16,17,18,19,21,22'BVEK
3840 DATA 23,25,26,28,29,31,33,35'BXQL
3850 DATA 37,39,42,44,47,195,195,
209'BBIN
3860 DATA 239,31,96,181,30,156,49,
223'BCVO
3870 DATA 165,135,134,162,223,62,193,
107'BFFQ
3880 DATA 33,37,42,44,50,44,42,37'BXQP
3890 DATA 33,135,162,62,193,60,193,
62'BCPR
3900 DATA 162,135,0,0,0,0,0,0'BTJI
3910 DATA 0,0,0,0,0,0,0,0,40'BQGI
3920 DATA 0,0,40,0,0,80,60,1'BSRJ
3930 DATA 84,255,1,65,255,2,168,
176'BABM
3940 DATA 3,250,240,31,254,240,95,
251'BCCN
3950 DATA 240,79,239,240,3,251,240,
61'BCJO
3960 DATA 4,208,48,65,192,48,20,
192'BAWP
3970 DATA 0,0,0,192,0,3,0,0,0'BRPO
3980 DATA 0,0,0,0,0,0,0,0,0'BPEP
3990 DATA 0,0,0,0,0,0,0,0,40'BQGQ
4000 DATA 0,0,40,0,0,80,60,1'BSRY
4010 DATA 84,255,1,65,255,2,168,
176'BABC
4020 DATA 3,250,240,31,254,240,95,
251'BCCD
4030 DATA 240,79,239,240,3,219,208,
15'BCQE
4040 DATA 208,196,12,5,196,3,3,16'BXUE
4050 DATA 0,204,0,0,0,0,0,0,0'BRGE
4060 DATA 0,0,0,0,0,0,0,0,0'BPEF
4070 DATA 0,0,0,0,0,0,0,0,40'BQGG
4080 DATA 0,0,40,0,0,80,60,1'BSRH
4090 DATA 84,255,1,65,255,2,168,
176'BABK
4100 DATA 3,250,240,31,254,240,95,
251'BCCC
4110 DATA 240,79,239,240,3,251,212,
0'BBDD
4120 DATA 240,49,0,63,193,0,17,48'BXSD
4130 DATA 0,19,0,0,4,0,0,0'BQQD
4140 DATA 0,0,0,0,0,0,0,0,0'BPEE
4150 DATA 0,0,0,0,0,0,0,0,40'BQGF
4160 DATA 0,0,40,0,0,80,60,1'BSRG
4170 DATA 84,255,1,65,255,2,168,
176'BABJ
4180 DATA 3,250,240,31,254,240,95,
251'BCCK
4190 DATA 240,79,239,240,3,251,252,
3'BBKL
4200 DATA 192,12,1,48,13,1,12,49'BWIC
4210 DATA 1,3,0,0,64,192,0,0'BSYC
4220 DATA 0,0,0,0,0,0,0,0,0'BPED
4230 DATA 0,0,0,0,0,0,0,0,40'BQGE
4240 DATA 0,0,40,0,0,80,60,1'BSRF
4250 DATA 84,255,1,65,255,2,168,
176'BABI
4260 DATA 3,250,240,31,254,240,95,
251'BCCJ
4270 DATA 240,79,239,240,3,251,252,
5'BBMK
4280 DATA 192,19,4,192,7,4,192,12'BXVK
4290 DATA 4,48,4,4,12,0,0,0'BRCK
4300 DATA 0,0,0,0,0,0,0,0,0'BPEC
4310 DATA 0,0,0,0,0,0,0,0,40'BQGD
4320 DATA 0,0,40,0,0,80,60,1'BSRE
4330 DATA 84,255,1,65,255,2,168,
176'BABH
4340 DATA 3,250,240,31,254,240,95,
251'BCCI
4350 DATA 240,79,239,240,3,251,240,
15'BCIJ
4360 DATA 192,76,29,0,67,211,0,67'BXXJ
4370 DATA 19,0,64,0,192,16,0,0'BUCK
4380 DATA 0,0,0,0,0,0,0,0,0'BPEK
4390 DATA 0,0,0,0,0,0,0,0,40'BQGL
4400 DATA 0,0,40,0,0,80,60,1'BSRD
4410 DATA 84,255,1,65,255,2,168,
176'BABG
4420 DATA 3,250,240,31,254,240,95,
251'BCCH
4430 DATA 240,79,239,240,3,251,240,
7'BBLI
4440 DATA 192,52,7,0,52,31,0,112'BWAI
4450 DATA 12,1,48,12,0,12,0,0'BTNJ
4460 DATA 0,0,0,0,0,0,0,0,0'BPEJ
4470 DATA 0,0,0,0,0,0,0,0,40'BQK
4480 DATA 0,0,40,0,0,80,60,1'BSRL
4490 DATA 84,255,1,65,255,2,168,
176'BABO
4500 DATA 3,250,240,31,254,240,95,
251'BCCG
4510 DATA 240,79,239,244,15,251,49,
61'BCXH
4520 DATA 64,49,49,0,196,49,0,0'BVBH
4530 DATA 196,0,0,0,0,0,0,0,0'BRQH
4540 DATA 0,0,0,0,0,0,0,0,0'BPEI
4550 DATA 0,0,0,0,0,0,0,0,0'BPEJ
4560 DATA 0,0,0,0,0,0,0,0,0'BPEK
4570 DATA 0,0,0,0,0,0,0,0,0'BPEL
4580 DATA 0,0,0,0,0,0,0,0,0'BPEM
4590 DATA 0,56,0,0,171,0,0,234'BURO
4600 DATA 0,0,170,0,0,20,0,0'BSIF
4610 DATA 80,0,0,80,0,0,84,0'BSBG
4620 DATA 0,0,0,0,0,0,0,0,0'BPEH
4630 DATA 0,0,0,0,0,0,0,0,0'BPEI
4640 DATA 0,0,0,0,0,0,0,0,0'BPEJ
4650 DATA 0,0,0,1,64,3,133,64'BTWL
4660 DATA 2,149,0,0,234,128,15,58'BXMM
4670 DATA 160,0,206,160,0,50,160,
0'BYJO
4680 DATA 0,0,0,0,0,0,0,0,0'BPEN
4690 DATA 0,0,0,0,0,0,0,0,0'BPEO
4700 DATA 0,0,0,0,0,0,0,0,0'BPEG
4710 DATA 0,0,0,0,0,0,0,0,0'BPEH
4720 DATA 0,0,0,0,0,0,0,0,0'BPEI
4730 DATA 0,0,0,0,0,0,3,128,0'BROJ
4740 DATA 2,149,64,0,229,80,15,58'BXXL
4750 DATA 80,0,206,160,0,50,160,0'BXRM
4760 DATA 0,0,0,0,0,0,0,0,0'BPEM
4770 DATA 0,0,0,0,0,0,0,0,0'BPEN
4780 DATA 0,0,0,0,0,0,0,0,0'BHXM

```

END

Defining the RUN/STOP and RESTORE keys on the Commodore 64

In BASIC, the RUN/STOP key is similar to the BREAK or ESC keys on other computers: It halts the running program. That's the problem. How can the computer test if the RUN/STOP key has been activated when the key has stopped the program? The answer is to disable the RUN/STOP key. This can be done using POKE 808,234.

Memory locations 808 (\$328) and 809 (\$329) point to the Kernal STOP routine at 63213 (\$F6ED). Together they are known as the "pointer." These two locations usually hold the values 237 and 246, respectively. If you multiply 246 by 256 and add 237, your answer will be 63213. Now let's poke our new value into memory location 808. Multiply 246 (we didn't change location 809) by 256 and now add 234. Your answer should be 63210, three bytes away from where the pointer usually points.

If you consult the *Commodore 64 Programmer's Reference Guide*, you'll find that the address 63210 is part of the Kernal SETTLE routine, a short routine that sets the software clock. Since we change the pointer to the end of this routine, LDY #58 and RTS, the RTS at the end will send the program back without ever passing into the next STOP routine. We more or less tell the computer to take a detour around the STOP key routine.

Machine language makes it easier to test the RUN/STOP key, because you don't have to worry about exiting to BASIC. But never store the 234 into memory location 808 until the program is completed because this location also disables the RUN/STOP and RESTORE keys. So make sure that the program is finished before you change that address. This location also affects the listing of a BASIC program by making it unreadable.



Add a pause feature to your programs using the RUN/STOP and RESTORE keys.

Test the RUN/STOP key in machine language by using

LDX \$C5; (you can use LDY or LDA as well)

CPX #3F; (again, you can use CPY or CMP)

BEQ PAUSE

The first instruction loads the value of location \$C5 (197 decimal), which holds the value of the last key pressed. Then the value is compared to the value 3F (63 decimal), or the value for the RUN/STOP key. Finally, the BEQ statement branches to your pause routine.

The BASIC version can be accomplished the same way by using

IF PEEK(197)=63 THEN (PAUSE) in which (PAUSE) is a line number where your pause routine will take place. You can also test the RUN/STOP key by using

```
10 GET K$:IF K$="" THEN 10
20 IF K$="[" THEN 50
30 GOTO 10
50 PRINT "PAUSED"
```

You'll notice that this is the common "get-from-keyboard" loop. However, in line 20, type the first quotation mark, press the RUN/STOP key, then type the second quotation mark. You should see a reversed "C" inside the

quotations when you're finished. This line can be modified to fit into any program, as long as you place it within the main program loop.

For example,

```
GET K$:IF K$="[" THEN (line number for pause routine)
```

tests the RUN/STOP key, and if it was pressed, the program will jump to your pause routine. If the key was not pressed, the program will continue.

Restore

On most cartridge programs, if you press the RESTORE key, the program will restart. This is because the cartridge port is the first thing checked by the computer when the RESTORE key is pressed. If there is a cartridge present, the computer activates it by entering through the warm start entry point.

If there isn't a cartridge present, the computer tests the RUN/STOP key for a RUN/STOP and RESTORE sequence. If both keys were pressed, the computer executes the RESTORE, IONIT, and a portion of the CINT Kernal routines. Then it filters back into the BASIC warm start vector. Finally, if the RESTORE key was pressed by itself, the BASIC program continues without stopping.

Once again, a machine-language program is easier to reset than a BASIC program. Simply change the NMINV pointer by poking its two memory locations 792 (\$318) and 793 (\$319) so that it points to where you would like to restart your program. I suggest the following instruc-

64 USERS ONLY/RUN-STOP AND RESTORE

tions:

LXD #01; (Of course, you can use LDY or LDA)

STX \$CC; (Use STY or STA if you changed the previous instruction)

CONTINUE YOUR PROGRAM...

This stores the numeral one into location \$CC (204 decimal). This isn't important, but screen printing may become sloppy without it. When the computer returns from the NMI interrupt, the cursor blink-enable location is reset and printing may be reversed.

The BASIC version of a reset is far more complex than the machine-language version. Usually a series of POKE numbers are required, but I've written Program 1 so all you have to do is load it, then your program.

This program creates the machine-language program, then loads your program. But it also does more. The routine resides in free memory between memory locations 679 (\$2A7) and 715 (\$2CB). The program activated at 689 first sets memory location 808 to 234 to disable the RUN/STOP and RESTORE sequence, then sets three pointers to point to the machine-language program at 679. These three pointers are the BRK Instruction Interrupt, Non-Maskable Interrupt (NMI), and the Main BASIC Program Loop vector.

The NMI pointer points to the ma-

chine-language program at 679 when the RESTORE key is pressed. The BRK points to the same program, just in case the RESTORE key was pressed with the RUN/STOP key. And finally, if the program does fall through and execute the BRK routine at 65126 (\$FE66), locations 770 and 771 will point to our machine-language routine. Since locations 770 and 771 are the vector that points to the Main BASIC Program Loop, or the "Direct Mode" where the "READY." prompt is printed, any time the prompt "READY." appears, our machine-language program will take over. This is just a precaution, in case the program does execute the BRK routine.

As for our miniature machine-language program between locations 679 and 689, this is where the cursor blink-enable flag is disabled and where the BASIC program resets. This program resets the BASIC program by jumping to the run routine at 43121 (\$A871). However, the appropriate starting line number is not found and an "UNDEF'D STATEMENT" error occurs. To prevent this, there must be a line zero. Program 1 automatically adds "0 REM" to the program that it loads. Since there is a line zero, there isn't an error.

Type in Program 1, make sure that you typed the data in correctly, and save it. Notice that the keyboard buff-

er is used to load the program, automatically add the line 0, and start the program by using SYS689. The program also CLR's and NEW's itself so that it won't interfere with an incoming program. Tape owners should remove the "8" in line 50.

Putting It Together

Program 2 at the end of this article is a demonstration of what has been covered in this article. Type and save Program 2, then reload Program 1. After you run Program 1, "READING DATA..." will appear, followed by the "LOAD:" prompt. Enter the file name of Program 2 and press RETURN. Once the program is loaded, try typing and pressing the RUN/STOP and RESTORE keys. Note that when you press the RUN/STOP key, your program pauses. Press it again to continue the program. Also notice the "POKE 198,0" in line 110. This clears the keyboard buffer so that the computer won't jump to the pause routine and then right back without letting you press RUN/STOP to continue. Take this line out and see what happens.

Remember, these are only sample programs. You can easily change them for your own use. The memory location 808 works exactly the same on the Commodore 128 in 128 mode.

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Program 1

```
5 PRINT CHR$(147); "[WHITE,SPACE5]
  READING DATA..."CGXJ
10 CK=0:POKE 53281,6:POKE 53280,
  14'DUKD
20 FOR A=679 TO 715:READ D:POKE A,D
  :CK=CK+D:NEXT IUWH
30 IF CK<>2921 THEN PRINT "[RVS]ERROR
  [RVOFF] IN DATA STATEMENTS"FGGK
40 PRINT CHR$(147); "LOAD:"
  :OPEN 9,0,0:INPUT#9,FL$
  :CLOSE 9'FVWI
50 PRINT CHR$(147); "[BLUE]
  LOAD"+CHR$(34)+FL$+CHR$(34)+",8
  [HOME,DOWN5]0 REM"IRTN
60 A$="[HOME]" + CHR$(13) + CHR$(13)
  + "SYS689" + CHR$(13) + "IOQL
70 FOR I=1 TO LEN(A$):POKE 630+I,
  ASC(MID$(A$,I)):NEXT:POKE 198,I-1
  :CLR:NEW'NFTR
```

```
100 DATA 169,1,133,204,76,113,168,0,0,
  0'BFLB
101 DATA 169,234,141,40,3,169,167,
  141'BDPB
102 DATA 2,3,141,22,3,141,24,3,169,
  2'BCLC
103 DATA 141,3,3,141,23,3,141,25,
  3'BAKD
```

END

Program 2

```
10 PRINT "[CLEAR,WHITE]":POKE 53281,11
  :POKE 53280,7'DRBC
20 PRINT "**THIS IS THE BEGINNING OF
  THE PROGRAM**"BAVI
30 PRINT "-[LEFT]";'BBJA
40 GET K$:IF K$="" THEN 40'EHEB
50 IF K$=CHR$(13) THEN PRINT "'FGKF
60 IF K$="" THEN GOSUB 100'EFPE
70 PRINT K$; "-2[LEFT]";:GOTO 40'CHMG
100 PRINT " ":PRINT "*** PAUSE ***"CBFY
110 POKE 198,0'BFXW
120 FOR C=1 TO 15:POKE 53280,C'EMRB
130 GET K$:IF K$<>"" THEN NEXT
  :GOTO 120'HJQE
140 POKE 53280,7:RETURN'CIUB
```

END

Memory Window

for the
Commodore 64

"Memory Window" provides a display reminiscent of science fiction-movie computers, with lots of blinking lights that allow you to see what is going on inside the Commodore 64's memory as it thinks about whatever Commodore 64's think about. In other words, Memory Window provides a look inside your Commodore 64's memory while it is running the program. In fact, even if you stop the program, Memory Window will continue to show you that the computer is still very busy thinking. This should provide a new perspective to even experienced users, as well as novices.

The glossary of computer terms that follows is provided to help the beginner get started and get the maximum benefit from the program. If these terms are already familiar, you might want to jump ahead.

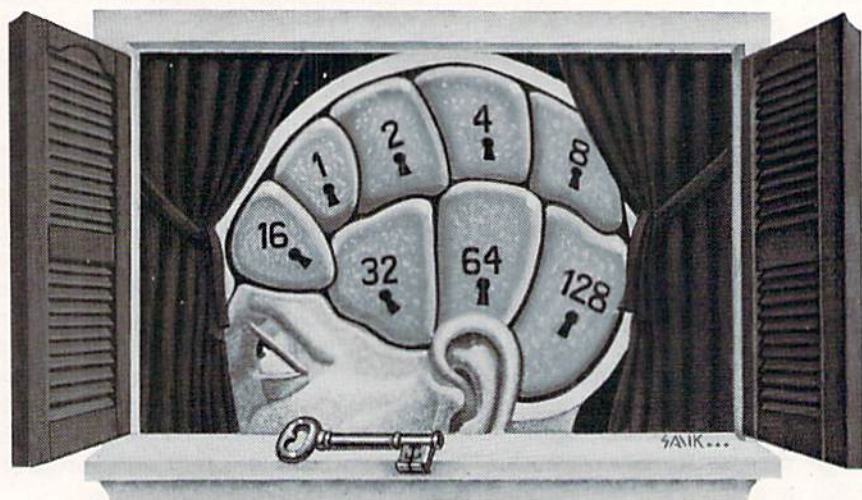
Computer Terms and Greek Made Clear

Bit: A contraction for the term binary digit. A single bit can represent only the numbers zero or one. Also used to describe a single unit of computer memory.

Byte: A unit of computer memory or a computer number consisting of eight binary digits or bits. The first eight binary digits are 1, 2, 4, 8, 16, 32, 64 and 128. The 256 decimal numbers, 0 through 255, can be expressed by a single byte or saved in a single byte of memory. 256 bytes make up a page.

Page: A term used to describe 256 bytes of memory. Four pages are contained in one kilobyte.

Kilobyte: Actually means 1024 bytes rather than 1000 bytes. Most of us grew up with the decimal number system where the progression of digits is 1's, 10's, 100's, 1000's, etc. These powers and multiples of ten are quite natural because we have ten fingers. Computers, on the other hand, have internal devices which count



Memory Window lets you see what's going on inside the Commodore 64's memory.

Even if you stop the programs, Memory Window will continue to show you that the computer is still very busy thinking.

more naturally by multiples or powers of two and the progression of digits is 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, etc. Since 1024 is the binary digit closest to 1000, it has, for the sake of convenience, been called a kilobyte.

K: The letter K, as in "64K of memory," is derived from the Greek (as in, "This is all Greek to me") word "chilioi" and the modern prefix "kilo" meaning 1000 (as in kilogram or kilometer). In computer jargon the "K" is an abbreviation for kilobyte.

RAM: The acronym or abbreviation for Random Access Memory, which is the part of the computer's memory that can be "written" into or used to save information. This information can subsequently be "read" or recalled. "Random access" means any location can be directly accessed if the address is provided. Most RAM is

also described as volatile, which means that the information is lost when the power goes off.

ROM: The acronym or abbreviation for Read Only Memory, which is the permanent or non-volatile part of the computer's memory. Information is put in the ROM when the computer is built and stays there when the power goes off, so it will be available each time you turn the computer on. It is the information in ROM, for example, that allows the Commodore 64 to know it is a Commodore 64 and not a PET or VIC 20, and to know what it should do when you press the keys on the keyboard.

Memory Myths and Microcomputer Misconceptions

MMMM 1: The Commodore 64 has 64K of memory. When you turn on the Commodore 64 it reports "64K RAM SYSTEM 38911 BASIC BYTES FREE." The Commodore 64 has a full 64K of RAM and 16 bits of addressing which permit addressing all 64K. However, it also has 20K of ROM, which is switched in parallel with the RAM. There are only 38911 bytes free for a BASIC program and its variables (actually 38912, which, divided by 1024, equals exactly 38K). So what happened to the other 26K? Some of it is used by the computer to keep track of what is on the TV or monitor screen and much of it is switched out and replaced by the BASIC interpreter ROM (8K), the Kernal operating system ROM (8K), the character-set ROM (4K), and some special

purpose devices like the sound chip and video chip.

MMMM 2: When you first turn on your computer, it does nothing until you type something and press RETURN. You might remember that the cursor was flashing, but even more interesting is the fact that a healthy computer is always executing between 160,000 and 1,000,000 machine-language instructions per second.

Getting Started with Memory Window

Type in the program and save it to tape or disk before running it. Since several POKes are used, a typing error could cause the computer to lock up when the program is run.

When Memory Window is run, it will display the contents of the first page of memory on the screen. Pressing the cursor-down key or SHIFT and cursor-up will move the window up and down from page 0 through page 63.

You can jump to any page by pressing the number keys for any number 00 through 63. The scale to the left of page 0, which increments in steps of 12 down the page, indicates the memory address or byte number.

It also should be noted that the Memory Window has 84 rows and each row has three bytes (24 bits) across. Therefore, the very top row contains bytes numbered 0, 1 and 2. The next row contains bytes numbered 3, 4 and 5 and so on.

If you have been paying very close attention, you may have noticed a couple of inconsistencies. I told you earlier that a page contained 256

bytes, and that is the truth. Memory Window's page is missing four bytes, numbered 63, 127, 191 and 255 (the addresses at the left take this into account).

What Does All That Blinking Mean?

Each small spot of light represents the contents of a single memory bit. When the spot of light is on, that means the corresponding memory location contains a one; and conversely when the screen is black it contains a zero. Now we should be ready to do some exploring of the computer's memory.

Page 0 is very busy, with lots of blinking, because the Commodore 64's microprocessor makes heavy use of these locations. Before we go on, let's stop the program by pressing the RUN/STOP key. Note the computer indicates "BREAK IN 290" and "READY," which confirms the program has stopped—but there is still quite a bit of activity. You may clear the screen by pressing SHIFT and CLR/HOME. Now type RUN and press RETURN.

You should be convinced now that the computer never really stops. In fact, it is executing between 160,000 and 1,000,000 instructions per second. The screen is refreshed with a new picture only 60 times per second, so some memory bits may be changing thousands of times faster than we are seeing them change.

Page 1 is called the "stack," and you should note the hot spot of activity down near the bottom of your screen. The stack is a temporary stor-

age area whose organization is often compared with the push-down stack of trays in a cafeteria. The first number placed on the stack is put on at location 511, and subsequent entries are built on that up toward location 256.

The rules for using the stack are similar to those for stacking trays—the last tray put on the stack is the first tray that will be taken off. If you save several things on the stack, you must take them all off if you want to get back to the first item you saved. Don't pile too many numbers on, or the stack will overflow. Also, don't try to take more off the stack than you put on.

Fortunately the stack is not a concern if you are programming in BASIC, because the microprocessor and built-in BASIC interpreter take care to follow the stack rules. When a BASIC program runs, the stack is used to save the location in the program that you return to when a GOSUB is executed.

Other instructions, such as FOR-NEXT-STEP and DEF, use stack space as well. Since the Memory Window program is fairly small and not too complex, the stack activity uses only a couple of dozen bytes of stack space. Press the space bar and notice the stack get busier as the program executes a GOSUB and a FOR-NEXT loop.

Pages 2 and 3 contain many pointers and buffer storage areas used by the Kernal operating system and the BASIC interpreter. These are numerous, and beyond the scope of this article.

Pages 4 through 7 are the standard locations for the numbers that create the text you see on the screen. The screen is saved starting at the upper left corner and progresses across each row for 40 characters and down the screen for 25 rows for a total of a thousand memory locations, from 1024 through 2023. In our case, it is all of the yellow information, excluding the white Memory Window itself.

If you watch the window carefully as you advance from page 4 to 5 to 6 to 7, you will notice activity ripple from top to bottom as the yellow memory address numbers update. Since the window is looking at one

Memory Window Map

PAGE	ADDRESS	CONTENTS
0	0 - 255	Microprocessor work area
1	256 - 511	Microprocessor stack area
2	512 - 767	Kernal and BASIC work area
3	768 - 1023	Kernal and BASIC work area
4	1024 - 1279	Screen memory
5	1280 - 1535	Screen memory
6	1536 - 1791	Screen memory
7	1792 - 2023	Screen memory
8	2048 - 2303	Basic program text
:		Variables
:		Arrays
:		:
:		:
63	16128 - 16383	BASIC string variables

64 USERS ONLY/MEMORY WINDOW

quarter of the screen memory, we can see the changes as they occur.

An interesting experiment is to display page 4, then stop the program again by pressing the RUN/STOP key and move the cursor all the way to the bottom of the screen. Now press the cursor-down key more to slowly scroll the text off the top of the screen and watch the Memory Window change until the screen is blank and only three vertical white lines remain. The screen memory is now filled with 1000 spaces, but a space is saved in screen memory as the number 32 (in binary digits this would be 00100000).

This may be getting a little too heavy, so let's try something more graphic before we leave our blank memory page 4. Remember, this is the upper quarter of the screen, so if we press the CLR/HOME key or move the cursor up, we should see it in the Memory Window. Now move the cursor from left to right and watch the flashing dot in the Memory Window.

Page 8 is the start of the BASIC program area, so if you type RUN, press RETURN, and then press the numbers 0 and 8, you will see what the Memory Window program itself looks like. There should be nothing changing on page 8 nor on the pages that follow until we get to page 13.

Page 13 says that the variables are stored beginning at location 3545 (or so). This is true for the Memory Window program as I typed it in. But it might be different for you if you added or deleted any spaces or REM's as you typed it in.

Since the variables start immediately after the program itself, we can also see the end of the program. This is

pretty hard to see on a TV screen, but if you look closely, you might find three consecutive types of zeros (all bits zero).

If you press the space bar, you will see a couple of bytes, down near the bottom counting up for a few seconds as the program executes a FOR-NEXT loop and the variable "I" counts from 0 to 243 in steps of 12.

Page 14 says that arrays start at 3643 (remember, that may be different for you). Arrays are "subscripted" variables, or variables with the same name that use a number in parentheses to differentiate one from the other—such as A(0), A(1), etc.

Page 15 says the end of arrays is at 3905. The memory from this point up to 40959 would normally be unoccupied, but could be filled with text strings if the program generates strings.

Pages 16 through 31 are available for text strings, but because the Memory Window uses sprites to display the memory, we see the character ROM image at the addresses for pages 16 through 31. Again, this is really beyond the scope of this article, but maybe it will give you some idea of how the computer can have RAM and ROM with the same addresses, and then switch (or bank) the memory to use one at one time and another later.

Pages 32 through 64 are currently just more space available for text string storage. The Memory Window program has changed the normal end of BASIC user memory from 40959 to 16383 because sprites are used for the window, and sprites are confined to the 16K block of memory which contains the screen memory.

Let's look at another interesting event. If you advance slowly, one

page at a time starting at page 32, allowing the address numbers to completely update, you will eventually see the Memory Window ripple up from the bottom.

What you are observing is the computer storing the text string starting at the high memory address and working its way down to the end of arrays. When the two meet, the computer does a bit of housekeeping called "garbage collection" and reclaims memory space by searching through all the strings, saving only the most recent ones and discarding the older ones. The time to collect garbage can be tens of minutes if the program uses a large number of different string variables and does many string manipulations.

Enough said about garbage, except that Memory Window allows you to see the garbage being created. If you are patient and nimble-fingered, once you see the strings moving by, you may be able to chase the event by entering a page number about two less than the current page and see the strings moving down again.

How Memory Window Does Its Magic

The program is fairly simple and the window trick is done with four sprites. Each sprite is 24 bits wide and 21 bits high, for a total of 63 bytes, which are saved in some unused memory area set aside for this purpose. Memory Window just takes whatever exists in a page of memory and assigns it to four sprites, which are positioned on the screen in a neat column to look like a single display. Hopefully Memory Window has allowed you to see some things more clearly than before.

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Memory Window

```
150 GOSUB 500'BDIB
170 PRINT HS"PAGE 00"'BCRE
180 PRINT DS"ADDRESS"'BCOG
190 GOSUB 200:GOTO 320'CHSG
200 PRINT HSDSDSDS'BIKX
210 FOR I=0 TO 243 STEP 12'EHTA
220 PRINT RIGHT$("[SPACE4]
    "+MID$(STR$(256*P+I),2),
    5)+CHR$(183);'JVPI
225 IF I<240 THEN PRINT'EERG
```

```
230 IF I=60 OR I=121 OR I=182 THEN
    I=I+1'JOEI
240 IF PEEK(197)<>64 THEN I=1E3'GLMG
250 NEXT:PRINT HS'CDRC
260 IF I<1E3 THEN POKE 198,0'EJHG
270 RETURN'BAQD
280 IF PEEK(197)=64 THEN GOSUB
    200'FKHJ
290 GET K$:IF K$="" GOTO 290'EIAJ
300 IF K$>="0" AND K$<="9" AND
    LEN(N$)<2 THEN N$=N$+K$'MPLI
310 N=VAL(N$):IF LEN(N$)=2 THEN N$=""
    :IF N<64 THEN P=N'LTJSJ
320 IF K$=U$THEN P=P+1:IF P>63 THEN
```

64 USERS ONLY/MEMORY WINDOW

```

P=0'JNBI
330 IF K$=D$ THEN P=P-1:IF P<0 THEN
P=63'JNRI
340 POKE 2040,P*4:REM MOVE
SPRITES'DTBH
350 POKE 2041,P*4+1'DIXF
360 POKE 2042,P*4+2'DIAG
370 POKE 2043,P*4+3'DICH
380 P$=RIGHT$( "0"+MID$(STR$(P),2),
2)'FNLL
390 PRINT H$TAB(5)P$'CGVI
400 PRINT H$D$D$D$D$D$TAB(15);'COSC
410 IF P=PEEK(46) THEN PRINT "START
VARIABLES"256*PEEK(46)+PEEK(45)
:GOTO 280'KUGN
420 IF P=PEEK(48) THEN PRINT "START
ARRAYS[SPACE3]"256*PEEK(48)+PEEK
(47):GOTO 280'KUGO
430 IF P=PEEK(50) THEN PRINT "END OF
ARRAYS[SPACE2]"256*PEEK(50)+PEEK
(49):GOTO 280'KUKP
440 IF P=PEEK(52) THEN PRINT "STRING
STORAGE "256*PEEK(52)+PEEK(51)
:GOTO 280'KUTQ
450 IF P=1 THEN PRINT "STACK AREA
[SPACE11]":GOTO 280'FGOL
460 IF P<4 THEN PRINT "BASIC WORK
AREA[SPACE6]":GOTO 280'FGQN
470 IF P<8 THEN PRINT "SCREEN MEMORY
[SPACE8]":GOTO 280'FGOO
480 IF P<16 OR P>31 THEN PRINT "BASIC
PROGRAM AREA[SPACE3]"
:GOTO 280'HKIR
490 IF P<32 THEN PRINT "CHARACTER ROM
IMAGE[SPACE2]":GOTO 280'FHEQ
500 REM BORDER AND BACKGROUND
BLACK'BYRG
510 POKE 53280,0:POKE 53281,0
:POKE 646,7'DVXF
520 C$=CHR$(147):PRINT C$;'DLPF
530 D$=CHR$(17):U$=CHR$(145)
:H$=CHR$(19):RV$=CHR$(18)'IEUN
540 FOR I=1 TO 24:CD$=CD$+D$:NEXT'GOXJ
550 V=53248:REM VIDEO CHIP START'CVAL
560 FOR I=0 TO 3'DDFH
570 POKE 2040+I,I:REM DATA
POINTERS'DUCN
580 POKE V+39+I,1:REM COLOR WHITE'ERCO
590 POKE V+2*I,80:REM X COORDS'EOKO
600 POKE V+2*I+1,82+I*42
:REM Y COORDS'HSGJ
610 NEXT'BAEB
620 POKE V+23,15:REM EXPAND X'DOKH
630 POKE V+29,15:REM EXPAND Y'DORI
640 POKE V+21,15:REM ENABLE
SPRITES'DUML
650 DIM A(50)'BFYG
660 RETURN'BAQG
    
```

END

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Pardon My Interruptions

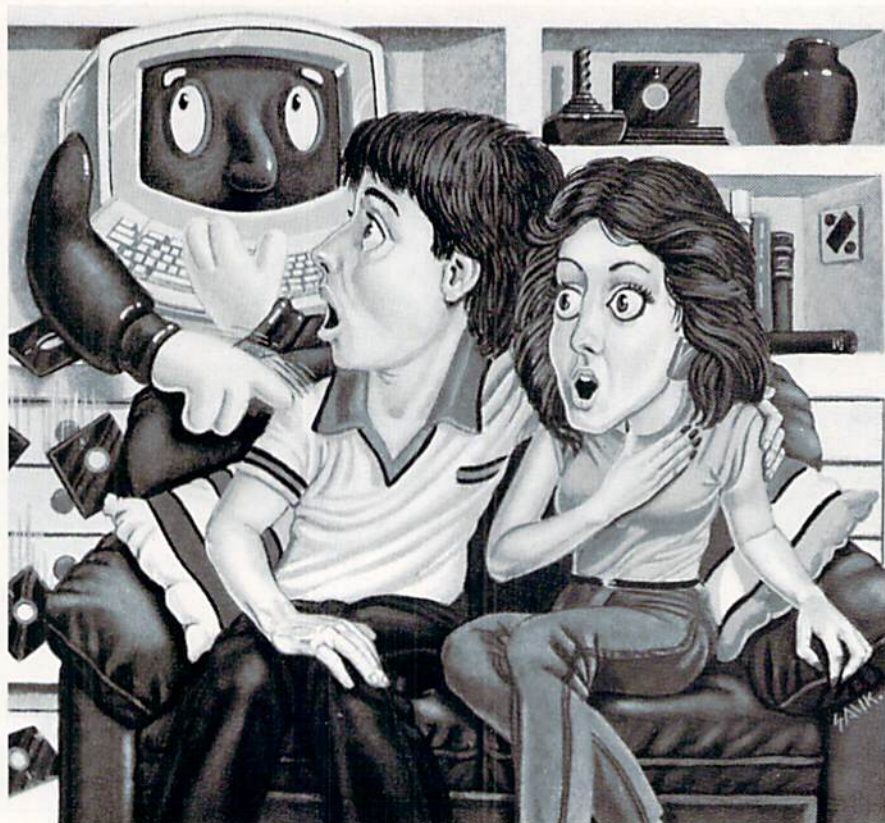
Three programs playing with the Commodore 64's hardware interrupt vectors

A lot of computer magazine writers—myself included—often make cavalier statements like “this program is interrupt-driven,” and “by changing the IRQ vectors at \$0314-0315, we can do such-and-so.” And many of you just breaking into (breaths held) *machine language* (relieved gasps) may wonder what in the world we’re talking about.

Not much, really. Whether your computer is in “command” mode (waiting for you to add a program line, LOAD or SAVE a program) or “program” mode (actually running a program), there are things it needs to do “in the background” to keep things running: update the internal clock that you look up with T1\$, scan the keyboard, and several other things that are too arcane for me to worry about.

Sixty times every second, the 64 “interrupts” whatever it’s doing and executes these routines. The important difference here between these routines and a regular program is that they are executed whether or not the computer is doing another job.

There are two memory locations in the 64, called “IRQ vectors,” that point in memory to where these “interrupt” routines begin. Sixty times a second, then, the 64 looks at this vector and jumps to the interrupt routines (often called “housekeeping routines”). The fun thing is that we can change this vector to point at our own machine-language program, as long as we make sure our program ends by sending the computer back to its normal interrupt routines. (Also, because the computer has so much else to do, we must be careful that our “interrupt-driven” program



The important difference between these routines and a regular program is that they are executed whether or not the computer is doing another job.

isn't too long.)

We can write programs, then, that execute constantly, whether a program is running or not. For example, Listing 1, “Flashcolors,” will change the screen and border colors over and over no matter what keys you push (other than RUN/STOP and RESTORE). Listing 2, “Spritemover,” will slowly march a sprite—in this example, just a solid block—from left to right across the screen. Listing 3, “Spooky Bells,” plays eerie-sounding

random bells. The fact that these effects take place while you’re programming, listing, loading or saving programs, or running programs is the fun part, and can seem disconcerting to the uninitiated. (Your friends may even wonder why your computer is smarter than theirs!)

Each of the three example programs can be turned on or off with SYS 50000. Yes, they’ll work in your own programs too!

For More Advanced Programmers

Look at the assembly listing for the Flashcolors program. You may add your own machine language routine starting at the label “Yours”—just make sure it ends with an RTS, so that control is sent to the 64’s normal interrupt routines by the JMP \$EA31.

Note that before changing the IRQ vectors, we must temporarily disable all interrupts with an SEI. Otherwise the system might try reading the vectors when we’re right in the middle of changing them, resulting in an almost certain crash. We re-enable the interrupts once the vectors are changed with the CLI instruction.

64 USERS ONLY/INTERRUPTIONS

Before typing these programs, read "How to Enter Programs," and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Listing 1. Flashcolors

```
20 GOSUB 2000'BEDY
30 SYS 50000 : END'CGBB
40 REM'BARA
2000 FOR J=50000 TO 50079:READ A
    :POKE J,A:NEXT:RETURN'HTPC
2010 DATA 173,78,195,201,1,240,18,120,
    169,123,141,20,3,169,195,141'BGAG
2020 DATA 21,3,88,169,1,141,78,195,96,
    120,169,49,141,20,3,169'BBHG
2030 DATA 234,141,21,3,88,169,0,141,
    78,195,96,32,129,195,76,49'BCSH
2040 DATA 234,238,160,195,173,160,195,
    201,100,16,1,96,238,161,195,
    173'BJMJ
2050 DATA 161,195,41,15,141,32,208,
    141,33,208,169,0,141,160,195,
    96'BGDK (END)
```

Listing 2. Spritemover

```
20 GOSUB 2000'BEDY
30 V = 53248 : REM SPRITE BASE
    VARIABLE'CAPH
40 POKE V+21,1 : REM TURN SPRITE 0
    ON'DTNH
50 POKE V+39,6 : REM MAKE IT BLUE'DQRH
60 POKE V+1,90 : REM VERTICAL
    COORDINATE'DYDK
70 POKE V+27,1 : REM MAKE IT APPEAR
    BEHIND CHARACTERS'DJKO
80 POKE 2040,13 : REM LOCATE IT IN
    CASSETTE BUFFER'CHIN
90 FOR X=832 TO 894:POKE X,255:NEXT
    :REM CREATE SOLID BLOCK'GGDQ
100 SYS 50000 : END'CGBW
120 REM'BARW
2000 FOR J=50000 TO 50102:READ A
    :POKE J,A:NEXT:RETURN'HTCC
2010 DATA 173,78,195,201,1,240,18,120,
    169,123,141,20,3,169,195,141'BGAG
2020 DATA 21,3,88,169,1,141,78,195,96,
    120,169,49,141,20,3,169'BBHG
2030 DATA 234,141,21,3,88,169,0,141,
    78,195,96,32,129,195,76,49'BCSH
2040 DATA 234,173,16,208,41,1,201,1,
    240,20,238,0,208,173,0,208'BCFI
2050 DATA 201,0,240,1,96,173,16,208,9,
    1,141,16,208,96,238,0'BYHI
2060 DATA 208,173,0,208,201,91,48,14,
    169,0,141,0,208,173,16,208'BDK
2070 DATA 41,126,141,16,208,96,96'BXDF (END)
```

Listing 3. Spooky Bells

```
20 GOSUB 2000'BEDY
30 SYS 50000 : END'CGBB
40 REM'BARA
```

```
2000 FOR J=50000 TO 50126:READ A
    :POKE J,A:NEXT:RETURN'HTIC
2010 DATA 173,78,195,201,1,240,18,120,
    169,123,141,20,3,169,195,141'BGAG
2020 DATA 21,3,88,169,1,141,78,195,96,
    120,169,49,141,20,3,169'BBHG
2030 DATA 234,141,21,3,88,169,0,141,
    78,195,96,32,129,195,76,49'BCSH
2040 DATA 234,173,4,220,41,16,201,16,
    240,1,96,169,15,141,24,212'BDPI
2050 DATA 173,4,220,41,3,201,3,240,
    247,170,232,224,1,240,11,224'BDVJ
2060 DATA 2,240,5,162,15,76,170,195,
    162,7,173,4,220,41,63,24'BAEK
2070 DATA 105,80,157,0,212,232,232,
    232,232,169,9,157,0,212,232,
    157'BGPM
2080 DATA 0,212,202,202,169,17,157,0,
    212,169,16,157,0,212,96'BAAM (END)
```

Flashcolors ML

```
; FLASHCOLORS
;
;
ONOFF =49998 ; ON/OFF FLAG
;
*= $C350 ; SYS 50000 TO ENABLE/DISABLE
;
LDA ONOFF ; GET ON/OFF FLAG
CMP #$01 ; IF A ONE, TURN OFF
BEQ OFF
;
; TURN ON "FLASHCOLOR"
;
SEI ; DISABLE INTERRUPTS
LDA #<BEGIN ; REDIRECT VECTORS
STA $0314
LDA #>BEGIN
STA $0315
CLI ; REENABLE INTERRUPTS
LDA #$01
STA ONOFF ; REMEMBER THAT WE'RE "ON"
RTS ; BACK TO BASIC
;
OFF ; TURN OFF "FLASHCOLOR"
;
SEI ; DISABLE INTERRUPTS
LDA #$31 ; REDIRECT VECTORS
STA $0314
LDA #SEA
STA $0315
CLI ; REENABLE INTERRUPTS
LDA #$00
STA ONOFF ; REMEMBER THAT WE'RE "OFF"
RTS ; BACK TO BASIC
;
BEGIN
JSR YOURS ; EXECUTE YOUR ROUTINE
JMP $EA31 ; BACK TO NORMAL INTRP ROUTINES
;
;
YOURS ; FLASHCOLORS CODE HERE
INC TIMER ; TIME TO SWITCH YET?
LDA TIMER
CMP #100
BPL YES
RTS ; NOT YET
YES INC COLOR ; NEXT COLOR
LDA COLOR
AND #$00001111 ; RIGHT 4 BITS ONLY
STA 53280
STA 53281
LDA #$00
STA TIMER
RTS
;
TIMER **++1
COLOR **++1
;
.END (END)
```

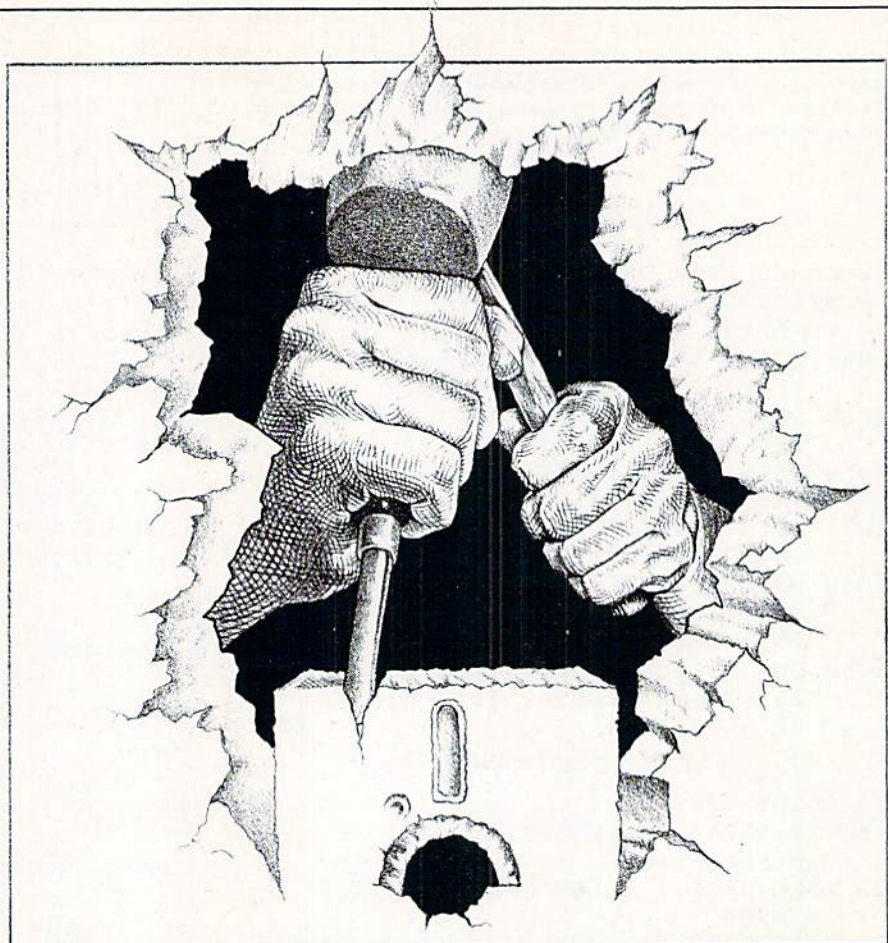
128 Disk Editor

How many times have you wanted to recall or edit disk sectors, and edit a sequential or relative file with ease? The Commodore 128 Disk Editor will help you to execute these tasks. With this editor you can read any sector, write any sector, jump file links, jump to previous links, and search forward and backward through sectors. The 128 Disk Editor also allows you to type text in any sector, change specific values, toggle single- or double-sided diskettes for the 1571, and even display the disk directory and accept DOS commands.

Using the 128 Disk Editor

The Commodore 128 Disk Editor contains many commands that allow you to read, edit, and write to disk sectors. With this program, you can change just about every sector on the disk, except for those with errors, of course. Once you have typed in and saved the 128 Disk Editor, type RUN. Your screen should blank for a few seconds, and, if you entered the data statements correctly, the computer will then display a screen with a window area at the top, and several boxes indicating the present and previous track and sector, along with a cursor position and character value. Underneath this is a list of commands. Finally, the bottom line displays the disk sides and the disk status.

Once the screen is displayed, the computer waits for your input. But notice that the text window at the very top of the screen is blank. When this window does not contain information, the computer will accept only four commands: Read, Disk Directory, DOS Commands, and the Select Side. You cannot use the Write, Text, Value, Jump, Jump Back, or Plus and Minus commands, because you have not yet read any sector. Therefore, during this "blank mode," you can either check the disk sides, send a DOS command, display the directory, or read a sector. However, once you have read a sector and the top window is filled with information, you



Read or write to any disk sector, jump file links, and search forward and backward through sectors using this handy utility.

then use any command.

Reading a Sector

When you press the "R" key to read a sector, the prompt window at the bottom of the screen displays "READ Track:." Enter the track number you wish to read and press RETURN. A "Sector:" prompt appears. Enter the desired sector number and press RETURN. If there are no errors in that particular sector, the top window displays what data the sector contains, in

ASCII form.

If there is an error, the top window displays the message "*** Disk Error ***" and the error is printed at the bottom of the screen. If the error is caused because you have tried to read a track above 35 on a single-sided disk while the program is in double-sided mode, the computer reminds you that the disk that you have in the drive is single-sided, and automatically selects the single-sided mode.

When reading a sector, press the RETURN key alone at the "Track:" prompt in order to use the current track, or the RETURN key alone at the "Sector:" prompt to use the current sector. Notice that the current track and sector are displayed in the upper left corner of the screen. Therefore, when you first run 128 Disk Editor, "Track: 18 Sector: 0" is displayed in the "Current" box as the default setting. If you press the RETURN key twice, the computer reads and displays track 18, sector 0. However, if you press the RETURN key once and enter a "1" at the "Sector:" prompt, the computer reads track 18, sector 1

and displays it. You can press the "R" key at any time and enter any new track and sector or press RETURN twice to re-read the current track and sector from your disk.

Writing to a Sector

Writing to a sector is similar to reading one, except for an extra option. Once you have pressed the "W" key, "WRITE Track:" will appear. Press RETURN twice to use the current track and sector. But you can also copy the data on that track and sector to any other track and sector.

For example, if, at "READ Track 1: Sector 0," you press the "W" key and entered "WRITE Track:1 Sector 1," sector 1 becomes an exact duplicate of sector 0. Finally, when you are finished entering the track and sector you wish to write to, you will be asked if you are sure you want to re-write that sector.

Using the Plus and Minus Symbols

Often you may wish to search forward and backward through disk sectors. This can be accomplished by pressing the plus and minus keys. If you read "Track: 18 Sector: 0" and then press the plus key, sector 1 is displayed. If you press "plus" again, sector 2 is displayed. Similarly, if sector 2 were displayed, and you pressed the minus key, you would move back to sector 1. Press minus a second time, and you go back to sector 0.

The 128 Disk Editor automatically jumps tracks when you try reading a sector below zero or above its greatest possibility. Therefore, when you press the minus key a third time, the computer automatically displays "Track: 17 Sector: 20." And if you press the plus key after reading this track, the computer displays "Track: 18 Sector: 0."

The Edit Mode

After you have read a sector and it has been displayed, the computer allows you to edit the sector. At the very top left corner of the screen, a yellow block should appear over the character. This is your cursor. By using the CRSR keys or the arrow keys, you can move the cursor around inside the display window. You should notice how it wraps from left to right,

To change a value in a sector, press "V," and enter the new value when you are prompted.

but not from top to bottom.

The "Position:" prompt will be followed by the position of the cursor inside of the display window. When the cursor is at the very top left corner, its position is 1. If you press CRSR left, the cursor will wrap to position 256 which is in front of the "128 Disk Editor" message. Pressing CRSR right wraps the cursor back to position 1.

When you use the CRSR right and left keys, the cursor will move right and left and the cursor position will increase or decrease by one. The CRSR up and down keys will move the cursor up or down one line and the position will increase or decrease by 40 since to move up or down a line really means moving 40 spaces on a 40-column screen. Below the "Position:" message, the value of the character underneath the cursor is displayed in both decimal and hex. You can press the HOME key at any time to move the cursor to position 1 or press any of the other command keys.

Editing with the Text and Value Commands

When you are editing a sector, you can only move around and select commands in the Edit Mode described above. In order to change what is displayed, you must either use the Text Mode or change individual values.

In order to change a single value, press the "V" key. Once you have pressed this key, "Enter New Value:" is displayed in the bottom prompt window. The computer will accept any decimal number between 0 and 255 followed by a RETURN. In addition, if you enter the "\$" symbol followed by two hexadecimal digits and a RETURN, the computer will accept the input and automatically translate the number to be written on the

screen. If you enter a number less than 0 (\$00) or greater than 255 (\$FF), the computer will ask you to re-enter the value. If you wish to escape from this mode, merely press the RETURN key alone to return to the Edit Mode.

The Text Mode allows you to type a series of characters into the display window. After pressing the "T" key, you will be asked to select either upper or lowercase characters. This is so you can easily retype ASCII characters that represent both screen codes (where a=1) and CHR\$ codes (where a=65). After you have selected upper or lower case, a flashing cursor appears. Now you can start typing characters.

If you make a mistake, do not use the CRSR keys to move around—they will not work, but will display their ASCII equivalents. In order to move backward, press the delete key. The cursor will move back one position, but will not erase the character at that position. Therefore, you must type the correct character over the one that the cursor is resting on.

It is also important to notice that the cursor will wrap on the screen similarly to the cursor in the Edit Mode, except you are not able to use the cursor keys. Once you have entered your text, press RETURN to return to the Edit Mode.

Displaying the Disk Directory

If you wish to see a list of the programs on the disk in the disk drive, press the "D" key in order to display the disk directory. The command summary will be erased and the directory will be displayed in that area of the screen. You must use the NO SCROLL key to stop the list. When you're finished viewing the list, press any key.

Jumping Tracks and Back

You may have noticed that by using the plus and minus keys, it could take a while to read through a disk. Also, if you try to follow any kind of file besides a relative file, the plus and minus keys do not show the next block of information for that file. In order to read the correct tracks and sectors that "link" a program together, you must use the "J" key (for the Jump

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command).

At the very top of the display window, in cursor position 1, there is a character that represents the next track of the file, and, at position 2, a character that represents the next sector. Press the HOME key if the cursor is not at position 1, then press the "J" key, and the computer reads the next correct link of the file.

You should notice that the Jump command can also be used while reading the Block Availability Map (BAM). After you have read "Track: 18 Sector: 0" and pressed the "J" key to jump through the BAM, you can place the cursor two characters in front of any file name and press "J" again to jump to the first sector of that program or file.

After you have familiarized yourself with the Jump command, you may find times when you wish you could jump back to the sector you were reading before you pressed "J," but you cannot use the minus key to jump back to the proper file link. Instead, you must use the "B" command to reread the last sector. The previous track and sector are displayed in the

Pressing "D" displays the disk directory.

Pressing "J" jumps you to the next sector in the file.

chart next to the current track and sector.

DOS Commands and Disk Status

After reading and writing to disks, you may find it necessary to send DOS commands to your disk drive. After pressing the "@" key for the DOS commands, you are greeted with the ">" sign and then a cursor. You can then type any of the following commands:

COMMAND
Initialize a disk
Validate a disk
Scratch files

FORMAT
i0 [RETURN]
v0 [RETURN]
s0 filename
[RETURN]

Format a new disk
Rename a filename
n0 header;id
[RETURN]
r0 filename1 = filename2
[RETURN]

You must enter the commands exactly the way they are displayed above, using the correct file names and header in order for them to work. If you wish to display the disk status, or if you wish to exit the DOS Command Mode, simply press the RETURN key to return to the Edit Mode.

Check and Select

Even though the 128 Disk Editor will work correctly with a 1541 disk drive, it was designed to be used with the 1571 disk drive. If you have the 1541, select the single-sided mode by pressing the "*" key, with an appropriate disk in the drive. However, if you own a 1571 you may edit either single- or double-sided diskettes. Merely press the "*" key to determine if the disk is single- or double-sided. If the disk is single-sided, you will be allowed to read up to track 35. If the disk is double-sided, you will be able to read all 70 tracks.

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

128 Disk Editor

```
50 FAST:PRINT"[CLEAR]":GRAPHIC 1,1
:GRAPHIC 0,1:GOSUB 1370:CLR
:DIM JT(250),JS(250)'HHBN
60 PRINT"[CLEAR,UNLOCK,LOWER CASE]"
:COLOR 4,14:COLOR 0,12
:PRINT"[HOME]";TAB(255);"[L. GREEN]
[RVS,CMDR J,SPACE4]128 [SHFT D]
ISK [SHFT E]DITOR[SPACE4]";'FSCR
70 DT$="[SHFT D,SHFT O,SHFT U,SHFT B,
SHFT L,SHFT E]":PS=1024
:REM IF YOU WANT SINGLE SIDED,
CHANGE "[SHFT D,SHFT O,SHFT U,
SHFT B,SHFT L,SHFT E]
" AND D=2 IN LINE 230'DDVD
80 PRINT"[RVOFF,SHFT *11,CMDR R,
SHFT *4,CMDR E,SHFT *6,CMDR R,
SHFT *16]"BAPK
90 PRINT"[SPACE2,YELLOW,RVS,SHFT C]
URRENT[RVOFF,SPACE2,L. GREEN,
SHFT -,SPACE3,RVS,YELLOW,SHFT P]
RIOR[RVOFF,SPACE3,L. GREEN,SHFT -]
[WHITE,SHFT P]OSITION:"BAEU
100 PRINT"[SHFT T]RACK
:[SPACE4,L. GREEN,SHFT -] [WHITE,
SHFT T]RACK:[SPACE4,L. GREEN,
SHFT -] [WHITE,SHFT V]ALUE:"BADG
```

```
110 PRINT"[SHFT S]ECTOR
:[SPACE4,L. GREEN,SHFT -] [WHITE,
SHFT T]RACK:[SPACE4,L. GREEN,
SHFT -] [WHITE]([SHFT H,SHFT E,
SHFT X]):'BARI
120 PRINT"[L. GREEN,SHFT *11,CMDR E,
SHFT *11,CMDR E,SHFT *16]"BAKD
130 FOR A=55296 TO 55296+255:POKE A,1
:NEXT'GTIF
140 PRINT"[DOWN,SPACE2,YELLOW,RVS,
SHFT R,RVOFF,WHITE]/[YELLOW,RVS,
SHFT W,RVOFF,L. GREEN] - [WHITE,
SHFT R]EAD/[SHFT W]RITE [SHFT T]
RACK AND [SHFT S]ECTOR"BAVO
150 PRINT"[SPACE2,YELLOW,RVS]+[RVOFF,
WHITE]/[YELLOW,RVS]-[RVOFF,
L. GREEN] - [WHITE,SHFT F]
ORWARD/BACKWARD [SHFT T]RACK &
[SHFT S]ECTOR"BAFO
160 PRINT"[SPACE4,YELLOW,RVS,SHFT J,
RVOFF,L. GREEN] - [WHITE,SHFT J]
UMP LINK UNDER CURSOR"BAML
170 PRINT"[SPACE4,YELLOW,RVS,SHFT B,
RVOFF,L. GREEN] - [WHITE,SHFT J]
UMP TO PREVIOUS LINK"BASM
180 PRINT"[SPACE4,YELLOW,RVS,SHFT T,
RVOFF,L. GREEN] - [WHITE,SHFT T]
EXT MODE, STARTING AT CURSOR"BAEP
190 PRINT"[SPACE4,YELLOW,RVS,SHFT V,
RVOFF,L. GREEN] - [WHITE,SHFT C]
HANGE VALUE UNDER CURSOR"BAGP
```

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```

200 PRINT"[SPACE4,YELLOW,RVS,SHFT D,
RVOFF,L. GREEN] - [WHITE,SHFT D]
ISK [SHFT D]IRECTORY"BAJF
210 PRINT"[SPACE4,YELLOW,RVS]@[RVOFF,
L. GREEN] - [WHITE,SHFT D,SHFT O,
SHFT S] [SHFT C]OMMANDS, [SHFT D]
ISK [SHFT S]TATUS"BAWK
220 PRINT"[SPACE4,YELLOW,RVS]*[RVOFF,
L. GREEN] - [WHITE,SHFT @]-
[SHFT S]ELECT [SHFT D]OUBLE/
[SHFT S]INGLE [SHFT S]IDED":SLOW
:IF BL=1 THEN 240:ELSE IF BL=2
THEN BL=0:GOTO 240:ELSE BL=0'NYS
230 CT=1:RT=18:RS=0:D=2:FOR A=1 TO 40
:PRINT"[L. GREEN,CMDR @]";
:NEXT'JXKL
240 PRINT"[HOME2]":FOR A=1 TO 22:PRINT
:NEXT:PRINT"[RVS,L. GREEN,SPACE8]
";DT$;" [SHFT S,SHFT I,SHFT D,
SHFT E,SHFT D] [SHFT D,SHFT I,
SHFT S,SHFT K,SHFT E,SHFT T2,
SHFT E,SPACE9,WHITE,RVOFF]";DS$;"
[HOME]":PRINT"[HOME,DOWN8]";
TAB(34);"[SPACE4]":IF BL=2 THEN
BL=0'NGOF
250 PRINT"[HOME,DOWN8]";TAB(34);
PS=1023;"[LEFT] ":PRINT TAB(31);
PEEK(PS);"[LEFT,SPACE2]"
:PRINT TAB(31);"$";
RIGHT$(HEX$(PEEK(PS)),2)'LINES
260 PRINT"[HOME,DOWN9]";TAB(7);RT;"
[LEFT] ";TAB(19);JT(CT-1);"[LEFT]
":PRINT TAB(7);RS;"[LEFT] ";
TAB(19);JS(CT-1);"[LEFT] "'IPZU
270 IF BL=0 THEN 300'DGCG
280 BK=PEEK(PS):POKE 54272+PS,7
:IF BK>=128 THEN POKE PS,BK-128
:ELSE POKE PS,BK+128'NOPV
290 IF BK=160 OR BK=224 THEN POKE PS,
BK'GPEM
300 GET K$:IF DE<>0 THEN 3000
:ELSE IF DS<>0 THEN 3000'KSNH
305 IF K$=""THEN 300:ELSE IF BL=0
THEN 460'HMXJ
310 POKE PS,BK:POKE 54272+PS,1'DPND
320 IF K$="[UP]"OR PEEK(212)=83 THEN
PS=PS-40'IPVI
330 IF K$="[DOWN]"OR PEEK(212)=84
THEN PS=PS+40'IPXI
340 IF K$="[LEFT]"OR PEEK(212)=85
THEN PS=PS-1:IF PS<1024 THEN
PS=1279'MCLP
350 IF K$="[RIGHT]"OR PEEK(212)=86
THEN PS=PS+1:IF PS>1279 THEN
PS=1024'MCFQ
360 IF PS<1024 THEN PS=PS+40'FMJJ
370 IF PS>1279 AND PS<1304 THEN
PS=PS-40:ELSE IF PS>1303 AND
PS<1322 THEN PS=PS-40'PMRX
380 IF K$="[HOME]"THEN PS=1024
:GOTO 240'FMSK
390 IF K$="W"THEN 720'DFRJ
400 IF K$="+"THEN 790'DFFB
410 IF K$="-"THEN 850'DFEC
420 IF K$="J"THEN 900'DFED
430 IF K$="B"THEN 950'DFBE
440 IF K$="T"THEN 980'DFWF
450 IF K$="V"THEN 1120'DGJG
460 IF K$="D"THEN 1190'DGXH
470 IF K$="@"THEN 1220'DGNI
480 IF K$="*"THEN 1330'DGSJ
485 IF K$="R"THEN 510'DFJO
490 GOTO 250'BDGI
500 REM ***** READ ROUTINE ***'BTHE
510 BL=1:WINDOW 0,24,39,24,1
:PRINT"[SHFT R,SHFT E,SHFT A,
SHFT D] [SHFT T]RACK:";
:WINDOW 11,24,13,24:CT=1:WF=0
:T$=""'HSYT
520 OPEN 9,0,0:INPUT#9,T$:CLOSE 9
:T=VAL(T$):IF T=0 THEN 550
:ELSE IF WF=1 THEN 735
:ELSE IF T<1 THEN 510'QMHT
530 IF D=1 AND T>35 THEN 510
:ELSE IF D=2 AND T>70 THEN
510'LRN
540 RT=T'BDVE
550 PRINT"[HOME2]"BAPE
560 WINDOW 16,24,39,24,1
:PRINT"[SHFT S]ECTOR:";
:WINDOW 23,24,25,24'DEOP
570 OPEN 9,0,0:INPUT#9,S$:CLOSE 9
:S=VAL(S$):IF S$=""THEN 670
:ELSE IF S<0 THEN 560'MFBU
580 IF D=2 AND RT>35 THEN TT=RT-35
:ELSE TT=RT'JRI
590 IF TT>35 OR TT<1 THEN JM=0
:GOTO 510'HOBQ
600 IF TT>=1 AND TT<=17 THEN
MS=20'ILTI
610 IF TT>=18 AND TT<=24 THEN
MS=18'IMFJ
620 IF TT>=25 AND TT<=30 THEN
MS=17'IMYK
630 IF TT>=31 AND TT<=35 THEN
MS=16'IMAL
640 IF WF=2 THEN RETURN'EDOH
650 IF JM=1 THEN 920'DGUI
660 IF S<0 OR S>MS THEN 560
:ELSE RS=S'HMQO
670 IF WF=0 AND RT>35*D OR RT<0 THEN
510:ELSE IF WF=1 AND RT>35*D OR
RT<0 THEN 735'REMA
680 IF WF=0 THEN 700'DGVL
690 GOTO 740'BDKK
700 OPEN 15,8,15:OPEN 5,8,5,"#"
:PRINT#15,"U1";5;0;RT;RS:SYS 8272
:SYS 8192:CLOSE 5:CLOSE 15
:IF DS=66 THEN 1330:ELSE PS=1024
:GOTO 240'NNIX
710 REM *** WRITE ROUTINE ***'BSJH
720 WINDOW 0,24,39,24,1
:PRINT"[SHFT W,SHFT R,SHFT I,
SHFT T,SHFT E] [SHFT T]RACK:";
:WINDOW 12,24,14,24'DDLR
730 WF=1:GOTO 520'CHRG

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735 IF T<1 THEN 720'DFDM
736 IF D=1 AND T>35 THEN 720
:ELSE IF D=2 AND T>70 THEN
720'LRV
737 GOTO 540'BDIM
740 PRINT"[HOME2]":WINDOW 0,24,39,24,
1'COOJ
750 PRINT"[CLEAR,SPACE2,SHFT R]E-
[SHFT W]RITE [SHFT T]RACK
:":RT;" [SHFT S]ECTOR
:":RS;"[LEFT]? ([RVS,SHFT Y,RVOFF]
/[RVS,SHFT N,RVOFF])[HOME]";
:WF=0'CNXY
760 GET KEY LP$:IF LP$<>"Y"THEN
240'GKR
770 OPEN 15,8,15:OPEN 5,8,5,"#"
:SYS 8224:PRINT#15,"U2";5;0;RT;RS
:CLOSE 5:CLOSE 15:IF DS<>0 THEN
3000:ELSE GOTO 240'MAMC
780 REM *** INCREASE SECTOR ROUTINE
***'BCCQ
790 S=RS+1:WF=2:GOSUB 580'EMNP
800 IF S>MS THEN RT=RT+1:S=0'GLEJ
810 IF D=1 AND RT>35 THEN 510'FJRI
820 IF D=2 AND RT>70 THEN 510'FJRJ
830 WF=0:RS=S:GOTO 700'DLNJ
840 REM *** DECREASE SECTOR ROUTINE
***'BCNN
850 S=RS-1:WF=2:GOSUB 580'EMOM
860 IF S<0 THEN RT=RT-1:GOSUB 580
:S=MS'HPHQ
870 IF RT<1 THEN 510'DGGM
880 WF=0:RS=S:GOTO 700'DLNO
890 REM *** JUMP BLOCK ROUTINE
***'BWMR
900 JM=1:IF PS<1279 AND PEEK(PS)<>0
THEN JT(CT)=RT:JS(CT)=RS:CT=CT+1
:RT=PEEK(PS):S=PEEK(PS+1)
:IF CT>255 THEN CT=0:GOTO 580
:ELSE GOTO 580'YTCL
910 GOTO 280'BDJF
920 IF S<0 OR S>MS THEN CT=CT-1
:RT=JT(CT):RS=JS(CT)'JDPS
930 RS=S:JM=0:GOTO 700'DLHK
940 REM *** JUMP TO PRIOR BLOCK
***'BWN
950 CT=CT-1:IF CT<1 THEN CT=1'GMDP
960 RT=JT(CT):S=JS(CT):IF RT=0 THEN
RT=18:GOTO 510:ELSE GOTO 580'JHDW
970 REM *** TEXT MODE ROUTINE ***'BVBQ
980 WINDOW 0,24,39,24,1'BNVO
990 PRINT"[CLEAR,SPACE6,RVS,SHFT U,
RVOFF]PPER OR [RVS,SHFT L,RVOFF]
OWER CASE WRITING?[HOME]";
:GET KEY W9$:IF W9$="L"THEN W9=1
:ELSE W9=0'JQLI
1000 PRINT"[CLEAR,SPACE4,SHFT T]EXT
[SHFT M]ODE ([SHFT P]RESS
[SHFT R,SHFT E,SHFT T,SHFT U,
SHFT R,SHFT N] TO EXIT)[HOME]";
'BBII
1010 GET IN$:IF IN$=CHR$(13)THEN
240'FOUA
1020 CK=PEEK(PS):BK=CK:IF BK>=128
THEN POKE PS,BK-128
:ELSE POKE PS,BK+128'MJPL
1030 FOR Z=1 TO 25:NEXT
:POKE PS,CK'FLDB
1040 IF PS>1279 THEN PS=1024'EMQC
1050 IF PS<1024 THEN PS=1279'EMSD
1060 IF IN$=CHR$(20)THEN PS=PS-1
:GOTO 1010'HRNH
1070 IF IN$=""THEN 1010'DHVD
1080 IF W9=0 THEN POKE PS,ASC(IN$)
:GOTO 1100'GQVI
1090 IF IN$>="@" AND IN$<="
[BACK ARROW]"THEN POKE PS,
ASC(IN$)-64:ELSE IF IN$>="
[SHFT @]" AND IN$<="
[SHFT UP ARROW]"THEN POKE PS,
ASC(IN$)-128:ELSE POKE PS,
ASC(IN$)'YSLF
1100 PS=PS+1:GOTO 1010'DKMX
1110 REM *** CHANGE VALUE ROUTINE
***'BYLB
1120 WINDOW 0,24,39,24,1'BNVY
1130 PRINT"[CLEAR,SPACE4,SHFT E]NTER
[SHFT N]EW [SHFT V]ALUE
:[HOME]";'BBGE
1140 WINDOW 20,24,23,24,1:OPEN 9,0,0
:INPUT#9,V$:CLOSE 9
:IF V$=""THEN 240'HIBJ
1150 IF LEFT$(V$,1)="$"THEN
VL$=RIGHT$(V$,2):V=DEC(VL$)
:ELSE V=VAL(V$)'LDBN
1160 IF V>255 OR V<0 THEN 1120'FKEF
1170 POKE PS,V:GOTO 240'CIVE
1180 REM *** DISPLAY DISK DIRECTORY
***'BBDJ
1190 WINDOW 0,12,39,21,1
:WINDOW 6,12,39,21,1:DIRECTORY
:PRINT"[DOWN] [SHFT P]
RESS ANY KEY TO CONTINUE"
:IF BL=0 THEN BL=2'ILJX
1200 GET KEY CZ$:PRINT"[CLEAR,HOME2]";
:FOR A=1 TO 12:PRINT:NEXT
:GOTO 140'JQOE
1210 REM *** DOS COMMAND ROUTINE
***'BXYC
1220 DA$="":DB$="":DC$="":DD$=""
:WINDOW 0,24,39,24,1:PRINT">";
:WINDOW 1,24,39,24:OPEN 9,0,0
:INPUT#9,DA$:CLOSE 9'KHOP
1230 IF LEFT$(DA$,1)="I" OR LEFT$(DA$,
1)="$"THEN DD$=LEFT$(DA$,2)
:GOTO 1300'KEQL
1240 IF DA$=""THEN 240'DGJC
1250 IF MID$(DA$,3,1)<>" "THEN
1220'FNAF
1260 DD$=LEFT$(DA$,2):FOR A8=4 TO
LEN(DA$):ED$=MID$(DA$,A8,1)
:IF ED$="":"OR ED$=""THEN
DB$=MID$(DA$,4,A8-4):GOTO 1270
:ELSE NEXT:DB$=MID$(DA$,4,
17)'VYCG
1270 IF ED$="":"OR ED$=""THEN

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```

DC$=MID$(DA$,A8+1,17)'IVDM
1280 IF ED$=";" THEN DB$=DB$+";"
      :ELSE IF ED$=" " THEN
      DB$=DB$+" "LTRP
1290 PRINT"[CLEAR]";DD$+"
      :"+DB$+DC$;"[HOME]";'EMRK
1300 OPEN 15,8,15:PRINT#15,DD$+"
      :"+DB$+DC$:CLOSE 15'GXQE
1310 GOTO 240'BDFX
1320 REM *** TOGGLE SINGLE/DOUBLE
      ***'BAXE
1330 DE=DS:OPEN 2,8,2,"$":CLOSE 2
      :OPEN 2,8,2,"$":GET#2,A$,B$
      :CLOSE 2:IF ASC(B$)=128 THEN D=2
      :DT$="[SHFT D,SHFT O,SHFT U,
      SHFT B,SHFT L,SHFT E]":ELSE D=1
      :DT$="[SHFT S,SHFT I,SHFT N,
      SHFT G,SHFT L,SHFT E]"'PCEE
1340 GOTO 240'BDFB
1360 REM *** READ ML ROUTINES ***'BUJH
1370 RESTORE:CD=0'CEVF
1380 READ D:IF D>255 THEN SA=D
      :GOTO 1380:ELSE IF D=-1 THEN
      1400'LVJP
1390 POKE SA,D:CD=CD+D:SA=SA+1
      :GOTO 1380'GVBO
1400 IF CD<>8405 THEN SLOW
      :PRINT"[RVS,BELL] ERROR IN DATA

```

```

STATEMENTS. [RVOFF]":STOP'HJEL
1410 RETURN'BAQX
1420 DATA 8192,162,5,32,198,255,160,0,
      32,207,255,153,0,4,192,255,240,4,
      200,76,7,32,32,195,255,32,204,
      255,96'BWGS
1430 DATA 8224,162,5,32,201,255,160,1,
      185,0,4,32,210,255,192,0,240,4,
      200,76,39,32,32,195,255,32,204,
      255,96'BVNS
1440 DATA 8272,162,255,169,32,157,0,4,
      240,4,202,76,84,32,96,-1'BCQL
3000 IF DE=66 THEN SYS 8272
      :GOTO 3100'FNIA
3005 SYS 8272:PRINT"[HOME,WHITE,TAB]
      [RVS]* * * [SHFT D]ISK [SHFT E]
      RROR * * * [RVOFF]"
      :PRINT"[DOWN,SPACE2,SHFT P]
      RESS ANY KEY TO ENTER A NEW
      SECTOR." 'DGTU
3010 DE=0:GET KEY DE$:SYS 8272:BL=0
      :OPEN 15,8,15,"I":CLOSE 15
      :GOTO 240'IHHI
3100 PRINT"[HOME,DOWN,SPACE5,SHFT T]
      HIS IS A SINGLE SIDED DISK,"
      :PRINT"[DOWN,SPACE4]
      PRESS A KEY TO RE-ENTER A SECTOR"
      :GOTO 3010'DGGQ

```

END

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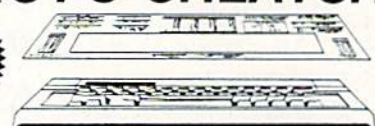
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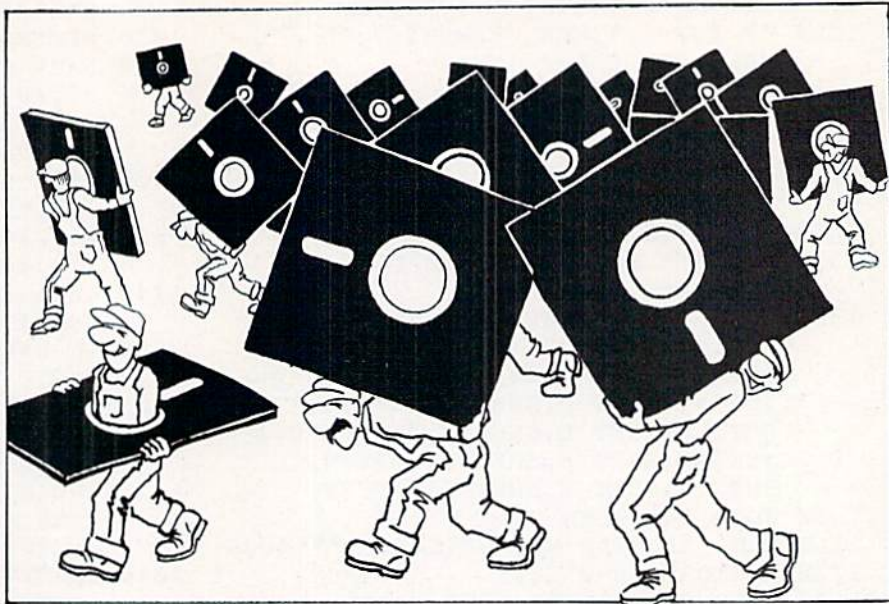
Moving BASIC Programs to the C128

There are a few things to watch out for when moving BASIC programs from other Commodore systems (including 64 mode on the 128) to run under BASIC 7.0 on the Commodore 128. The most obvious problems are caused by PEEKs and POKEs within a BASIC program. When running in 128 mode, memory locations are altered, so PEEK and POKE addresses for any other Commodore system will no longer correspond. The WAIT and SYS commands also fall into this category, since they rely on specific addresses. If you do have to use PEEK, POKE, SYS or WAIT commands, remember to select the appropriate memory range with the new BANK command.

Although the addresses for these commands can be manually converted to the Commodore 128 (especially the SYS and WAIT commands), an even better approach might be to replace that instruction (and possibly some additional code in the same area of the program) with one or more of the new BASIC 7.0 commands. A BASIC 7.0 command might be able to do just what the PEEK or POKE command was attempting to accomplish on the other machine.

For example, the USR function on older systems made a system call to a subroutine starting at an address in certain low memory locations. On the Commodore 64 (or 64 mode on the 128), the subroutine address is stored in locations 785 and 786. The VIC 20 and even older PET and CBM systems have the USR vector at locations 1 and 2. Under BASIC 7.0, the starting address must be placed in locations 4633 and 4634. Unfortunately, the routine being called will also more than likely have to be moved as well.

The FRE function on any other Commodore system simply returns the amount of free memory available for BASIC. In the past, the argument of the FRE function was ignored for the most part, and a zero was normally used by most programmers. Under



BASIC Scanner scans older BASIC programs on disk to look for possible problem areas in converting the programs to BASIC 7.0.

BASIC 7.0, the argument of the FRE function now represents the equivalent memory bank number. If a zero is used, the amount of free BASIC program space will be returned. If a one is used, the amount of free BASIC working storage will be returned.

If an older program is using the value returned by the FRE function to determine if enough working storage is available, the FRE argument will have to be changed from zero to one for the program to function properly. Previously, an old trick was to use the FRE function to force a "garbage collection" on string space to get rid of unused strings and free up additional working storage. But in 128 mode, the FRE command cannot access the proper memory space used for working storage.

Another command whose operation has changed in BASIC 7.0 is the LIST command. In older versions of BASIC, it would list the specified program lines and the program would stop. In BASIC 7.0, the program lines are listed as expected, but the program resumes operation after listing the lines.

Another area of caution is in the use of certain reserved variables within older programs. In older versions of BASIC, only TI, TI\$ and ST were reserved variables that you could not use as general variables within your program. When BASIC 4.0 disk commands were added, DS and DS\$ were also added to the reserved variable list for disk status. Now BASIC 7.0 adds ER and EL for error trapping within BASIC programs, in addition to the DS and DS\$ disk status variables. If an older program happens to use any of these variables, simply change them to something else, and there should not be any problems.

The Program

To make things a little easier when converting programs to the 128 under BASIC 7.0, I've written a simple utility program that's included here. "BASIC Scanner" scans BASIC programs saved on disk to look for possible problem areas for BASIC 7.0. It should not be used to scan programs generated under BASIC 7.0, since it was not de-

128 USERS ONLY/MOVING BASIC

signed for this purpose. However, the program itself can be run on any Commodore system (128, 64, VIC 20, PET, CBM) with any disk drive.

The program first asks for the file name of the program to be scanned. It then asks if you'd like a printed output of the results. Once the file is opened, the program begins to scan the program file on disk. If any disk errors are encountered, an appropriate disk error message will be displayed and the program will abort.

As the program scans the lines of the BASIC program file, each line number will be displayed on the screen. If a problem area is encountered, the exact token or variable will be indicated following the line number. If more than one problem area appears on the same line, they will be indicated in the order they appear.

You can press any key on the keyboard to suspend the scanning process at the end of any program line. Press the key only once, because the program will continue with another key press. If the "Q" key is pressed while the process is suspended, the program will stop scanning the program file and properly close all files. For convenience, these same features will suspend the printer output as well as the screen displays.

The output of this program can then be used to pinpoint the exact areas of the program that may need to be modified under BASIC 7.0. If only reserved variables are found, it should be very simple to change the variable names. Otherwise, a detailed analysis of the program may be necessary. In either case, the areas of concern are identified for you by the BASIC Scan-

ner program.

BASIC Scanner is currently programmed to look for the following BASIC commands or functions (tokens)

PEEK POKE WAIT SYS USR FRE LIST and the following BASIC reserved variables

DS DS\$ EL ER

If additional commands are later determined to be potential problem areas, you can expand the list by changing the number of tokens specified by NT, the decimal token values in array PT, and the actual token string in array PT\$. To add additional variables, you can change the number of variables specified by PV and the actual variable names in array PV\$. See program lines 250 to 330 for these variables. The tokens and variables currently checked are the only ones I believe should be a problem. **C**

Before typing this program, read "How to Enter Programs," and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

BASIC Scanner

```

190 PRINT "[CLEAR]"; SPC(12);
    "BASIC SCANNER[DOWN2]" 'CFRK
200 PRINT "THIS PROGRAM CHECKS OLDER
    BASIC" 'BANF
210 PRINT "PROGRAMS FOR POSSIBLE
    PROBLEM AREAS IF" 'BAZI
220 PRINT "THEY ARE TO BE LOADED INTO
    A C-128 AND" 'BATH
230 PRINT "RUN IN 128 MODE UNDER BASIC
    7.0" 'BAAH
240 PRINT "[DOWN]WHILE RUNNING,
    PRESS ANY KEY TO SUSPEND"
    : GOSUB 990 'CEUM
250 NT=7: NV=4: DIM PT(NT), PT$(NT),
    PV$(NV) 'DFTK
260 PT(1)=194: PT$(1)="PEEK" 'CPMH
270 PT(2)=151: PT$(2)="POKE" 'CPRI
280 PT(3)=146: PT$(3)="WAIT" 'CPEJ
290 PT(4)=158: PT$(4)="SYS" 'CPLK
300 PT(5)=183: PT$(5)="USR" 'CPGC
310 PT(6)=184: PT$(6)="FRE" 'CPFD
320 PT(7)=155: PT$(7)="LIST" 'CPTE
330 PV$(1)="DS": PV$(2)="DS$"
    : PV$(3)="EL": PV$(4)="ER" 'ECVL
340 PRINT "FILENAME OF BASIC PROGRAM
    TO BE CHECKED": INPUT F$ 'CDEN
350 CLOSE 15: OPEN 15,8,15 'CKIF
360 OPEN 5,8,5,0: "+F$+",P,R"
    : GOSUB 1000 'ENQJ
370 PD=4: PRINT "[DOWN]WANT PRINTED
    OUTPUT (Y/N): "; 'CFJN
380 GET C$: IF C$="N" THEN PD=3
    : GOTO 400 'GMVL

```

```

390 IF C$<>"Y" THEN 380 'EFQJ
400 PRINT C$: OPEN 4,PD 'CHEA
410 GOSUB 990: PRINT#4,
    "SCANNING BASIC PROGRAM: "; F$
    : PRINT#4 'DLIJ
420 IF PD=4 THEN PRINT "SCANNING BASIC
    PROGRAM: "; F$: PRINT 'FHEL
430 GOSUB 960: REM IGNORE LOAD
    ADR 'CRAG
440 GOSUB 960: IF V+V1=0 THEN PRINT
    : PRINT TAB(10); "< DONE >"
    : GOTO 1020 'JSON
450 GET C$: IF C$="" THEN 510 'EIJH
460 PRINT:PRINT " "; TAB(10);
    "SCANNING SUSPENDED" 'DGJM
470 PRINT "PRESS ANY KEY TO CONTINUE,
    'Q' TO QUIT" 'BAYP
480 GET C$: IF C$="Q" THEN
    PRINT "SCANNING ABORTED"
    : GOTO 1020 'GKBQ
490 IF C$="" THEN 480 'DFFJ
500 PRINT "SCANNING RESUMED... [DOWN]"
    'BADE
510 GOSUB 960: LN=V1+(256*V)
    : PR=0 'FSTH
520 PRINT RIGHT$("[SPACE9]" + STR$(LN),
    8); "[SPACE8]": PRINT "[UP]"; 'FLGJ
530 GOSUB 970 'BDTD
540 IF V=0 THEN 440 'DECG
550 IF V<>34 THEN 600 'EGHH
560 REM - QUOTE FOUND, SKIP CHARS TO
    NEXT QUOTE OR LINE END 'BQTR
570 GOSUB 970: IF V=34 THEN 530 'EKJK
580 IF V>0 THEN 570 'DFFK
590 GOTO 440 'BDHJ
600 IF V<>131 THEN 680 'EHFE
610 REM - DATA TOKEN FOUND,
    SKIP CHARS TO COLON OR LINE
    END 'BQAN

```

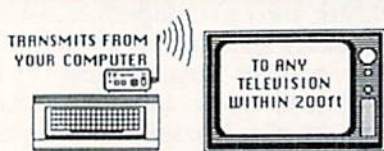
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MOVING BASIC

```

620 GOSUB 970: IF V=58 THEN 530'EKPG
630 IF V=0 THEN 440'DFCG
640 IF V<>34 THEN 620'EGJH
650 GOSUB 970: IF V=34 THEN 620'EKJJ
660 IF V>0 THEN 650'DFEJ
670 GOTO 440'BDHI
680 IF V<>143 THEN 720'EHDH
690 REM - REMARK FOUND,
      SKIP TO LINE END'BBEQ
700 GOSUB 970: IF V>0 THEN 700'EJCF
710 GOTO 440'BDHD
720 IF V<>206 AND V<>254 THEN 760'HLLK
730 REM - IGNORE BASIC 7.0 TWO BYTE
      TOKENS (JUST INCASE)'BPTP
740 GOSUB 970: IF V=0 THEN 440'EJEJ
750 GOTO 530'BDHH
760 REM - CHECK FOR PROBLEM
      TOKENS'BWEN
770 Y=0: FOR X=1 TO NT: IF V=PT(X)
      THEN Y=X: X=NT'JUDT
780 NEXT X: IF Y=0 THEN 820'EHBH
790 IF PR=1 THEN PRINT#4,"[SPACE10]";
      : GOTO 810'FKIQ
800 PRINT#4,RIGHT$("[SPACE8]
      "+STR$(LN),8);": "": PR=1'FQTK
810 PRINT#4,RIGHT$("[SPACE5]"+PT$(Y),
      4);" - TOKEN"'DNRK
820 REM - CHECK FOR PROBLEM
      VARIABLES'BAUL
830 IF V<65 OR V>90 THEN 530'FJSK
840 SS=C$: GOSUB 970: IF V<48 OR V>90
      THEN 890'HSCO
850 IF V>57 AND V<65 THEN 890'FJEM
860 SS=SS+C$'CGBK
870 GOSUB 970: IF V<48 OR V>90 THEN
      890'GNPG
880 IF V<58 OR V>64 THEN 870'FJDP
890 IF V=36 OR V=37 OR V=40 THEN
      SS=SS+C$: GOSUB 970'KTXV
900 Y=0: FOR X=1 TO NV: IF SS=PV$(X)
      THEN Y=X: X=NV'JWDO
910 NEXT X: IF Y=0 THEN 540'EHAH
920 IF PR=1 THEN PRINT#4,"[SPACE10]";
      : GOTO 940'FKML
930 PRINT#4,RIGHT$("[SPACE8]
      "+STR$(LN),8);": "": PR=1'FQTO
940 PRINT#4,RIGHT$("[SPACE5]"+PV$(Y),
      4);" - VARIABLE"'DNNP
950 GOTO 540'BDIJ
960 GOSUB 970: V1=V'CHUL
970 GET#5,C$: GOSUB 1000: V=0
      : IF C$<>" THEN V=ASC(C$)'JVQU
980 RETURN'BAQL
990 PRINT: FOR X=1 TO 39: PRINT"-";
      : NEXT X: PRINT: PRINT
      : RETURN'JMRU
1000 INPUT#15,EN,EM$,ET,ES
      : IF EN=0 THEN RETURN'FTFA
1010 PRINT"[DOWN]DISK ERROR[DOWN]"
      : PRINT EN;EM$;ET;ES'CNAB
1020 CLOSE 5: CLOSE 6: CLOSE 15
      : CLOSE 4'EIAY
    
```

END

SELF REPLICATION

Continued from pg. 63

```

35 FOR I= 0 TO 1023 : T=
   PEEK(M+I+40)+PEEK(M+I-40)+PEEK
   (M+I+1)+PEEK(M+I-1)'TFPX
40 POKE S+I,(T AND 1)+96 : NEXT'FKXF
45 FOR I = 0 TO 1023 : POKE M+I,
   PEEK(S+I)-96:NEXT'JREO
50 GOTO 35'BCPB (END)

      REPRO-FAST
5 REM REPERO-FAST; PRESS ANY KEY TO
  CAUSE REPRODUCTION'BRCQ
7 FOR X=49152 TO 49393:READ A:POKE X,A
  :NEXT'GSWM
10 PRINT"[CLEAR]":M=9216:ND=49395'DOUC
15 SYS ND-243:SYS ND-218'ELKH
20 POKE M+418,1:POKE M+458,1
  :POKE M+498,1:POKE M+459,1
  :POKE M+460,1'KJHL
25 SYS ND-193'CFTE
30 GET RS:IF RS=""THEN 30'EHOD
35 SYS ND-157'CFTE
40 GOTO 30'BCKA
100 DATA 169,216,133,254,160,0,132,
  253,169,1,145'BOID
110 DATA 253,200,208,251,166,254,232,
  134,254,224,220,208'BWPF
120 DATA 242,96,169,35,133,254,160,0,
  132,253,169,0'BQKF
130 DATA 145,253,200,208,251,166,254,
  232,134,254,224,41'BVSH
140 DATA 208,242,96,169,36,133,252,
  169,4,133,254,160'BSVH
150 DATA 0,132,251,132,253,177,251,24,
  105,96,145,253'BSCI
160 DATA 200,208,246,230,252,166,254,
  232,134,254,224,8'BUVK
170 DATA 208,235,96,169,4,133,254,160,
  0,132,253,185'BROK
180 DATA 216,35,24,121,255,35,24,121,
  1,36,24,121'BOSK
190 DATA 40,36,41,1,24,105,96,145,253,
  200,208,231'BPRM
200 DATA 230,254,160,0,185,216,36,24,
  121,255,36,24'BQXE
210 DATA 121,1,37,24,121,40,37,41,1,
  24,105,96'BLTE
220 DATA 145,253,200,208,231,230,254,
  160,0,185,216,37'BTGT
230 DATA 24,121,255,37,24,121,1,38,24,
  121,40,38'BNWG
240 DATA 41,1,24,105,96,145,253,200,
  208,231,230,254'BRQI
250 DATA 160,0,185,216,38,24,121,255,
  38,24,121,1'BOBI
260 DATA 39,24,121,40,39,41,1,24,105,
  96,145,253'BNJJ
270 DATA 200,208,231,230,254,169,36,
  133,252,169,4,133'BTCL
280 DATA 254,160,0,132,251,177,253,56,
  233,96,145,251'BSLM
290 DATA 200,208,246,230,254,166,252,
  232,134,252,224,40'BVNO
300 DATA 208,235,96'BKAY (END)

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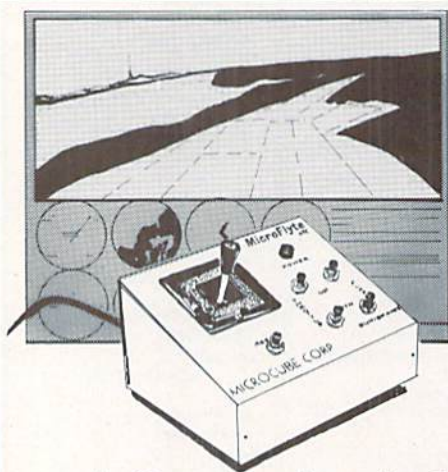
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PERSONAL PORTFOLIO MANAGER

Continued from pg. 20

It also has the one program you should use every time you boot *Personal Portfolio Manager*: the Exit routine. Using Exit ensures that all files are updated and closed. Just pulling the disk from the drive and powering down the 64 is a definite no-no. Your files won't be there anymore!

Entering new securities is straightforward, except for one thing. After each is entered, you are returned to the previous screen. To enter a series of new securities, you must continually select the proper function key to redisplay the entry screen. This is particularly frustrating when setting up new portfolios.

There is a nice search feature built in. In the Maintenance option, you can enter the security symbol (GM for General Motors stock, for example) to directly access it.

File limits are rather generous, at least 1,000 open transactions per disk, while closed transactions are limited only to the amount of free disk space. Another nice touch is the

handling of fractional quotes. Enter 1/8 and the computer adjusts it to .125. Of course, you can also enter the decimal figures directly. Dates must have the "/" entered; the program does not add them for you.

The Sell feature tracks date, price, number of units involved in the transaction, commission and the proceeds. Long- or short-term gains or losses are calculated based on previous inputs.

With one disk drive, there are times when you must make swaps involving the program and at least one data disk. The program does a very good job of informing you when the wrong disk is in the drive. It tells you which disk it is looking for as well and identifies the incorrect one.

When accessing data bases, you can download quotes and run reports automatically. This is a great time-saver, and also reduces errors. The 8,000-character buffer can be saved to disk or sent directly to a printer.

A weak point surfaces when you use the Reports option. Halfway through the tutorial, you learn that

reports cannot be generated unless the report programs are on the data disk. To do this, you must close the data files (using the Exit option) and reboot the Master disk to load and transfer the report programs. This is cumbersome and time consuming. After transferring the programs (five passes, seven minutes), you have to reload the program from scratch.

Standard reports are selected from the menu. Customized reports require a bit of work, but the very fact that *Personal Portfolio Manager* even supports specialized reports emphasizes its serious nature.

While it is true that *Personal Portfolio Manager* has a few rough spots, they are minor when compared to the overall effectiveness and power. The program can be summed up in a few words: a customized data base with advanced telecommunications features and a relatively sophisticated report generator. This combination is hard to beat on any microcomputer, especially on the 64. If you need such a package, don't pass this one by. **C**

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HOW TO ENTER PROGRAMS

The programs which appear in this magazine have been run, tested and checked for bugs and errors. After a program is tested, it is printed on a letter quality printer with some formatting changes. This listing is then photographed directly and printed in the magazine. Using this method ensures the most error-free program listings possible.

Whenever you see a word inside brackets, such as [DOWN], the word represents a keystroke or series of keystrokes on the keyboard. The word [DOWN] would be entered by pressing the cursor-down key. If multiple keystrokes are required, the number will directly follow the word. For example, [DOWN4] would mean to press the cursor-down key four times. If there are multiple words within one set of brackets, enter the keystrokes directly after one another. For example, [DOWN,RIGHT2] would mean to press the cursor-down key once and then the cursor-right key twice. Note: Do not enter the commas.

In addition to these graphic symbols, the keyboard graphics are all represented by a word and a letter. The word is either SHFT or CMD and represents the SHIFT key or the Commodore key. The letter is one of the letters on the keyboard. The combination [SHIFT E] would be entered by holding down the SHIFT key and pressing the E. A number following the letter tells you how many times to type the letter. For example, [SHFT A4,CMD B3] would mean to hold the SHIFT key and press the A four times, then hold down the Commodore key and press the B three times.

The following chart tells you the keys to press for any word or words inside of brackets. Refer to this chart whenever you aren't sure what keys to press. The little graphic next to the keystrokes shows you what you will see on the screen.

Syntax Error

This is by far the most common error encountered while entering a program. Usually (sorry folks) this means that you have typed something incorrectly on the line the syntax error refers to. If you get the message "?Syntax Error Break In Line 270," type LIST 270 and press RETURN.

This will list line 270 to the screen. Look for any non-obvious mistakes like a zero in place of an O or vice-versa. Check for semicolons and colons reversed and extra or missing parentheses. All of these things will cause a syntax error.

There is only one time a syntax error will tell you the wrong line to look at. If the line the syntax error refers to has a function call (e.g., FN A(3)), the syntax error may be in the line that defines the function, rather than the line named in the error message. Look for a line near the beginning of the program (usually) that has DEF FN A(X) in it with an equation following it. Look for a typo in the equation part of this definition.

Illegal Quantity Error

This is another common error message. This can also be caused by a typing error, but it is a little harder to find. Once again, list the line number that the error message refers to. There is probably a poke statement on this line. If there is, then the error is referring to what is trying to be poked. A number must be in the range of zero to 255 to be poke-able. For example, the statement POKE 1024,260 would produce an illegal quantity error because 260 is greater than 255.

Most often, the value being poked is a variable (A,X...). This error is telling you that this variable is out of range. If the variable is being read from data statements, then the prob-

lem is somewhere in the data statements. Check the data statements for missing commas or other typos.




































If the variable is not coming from data statements, then the problem will be a little harder to find. Check each line that contains the variable for typing mistakes.

Out Of Data Error

This error message is always related to the data statements in a program. If this error occurs, it means that the program has run out of data items before it was supposed to. It is usually caused by a problem or typo in the data statements. Check first to see if you have left out a whole line of data. Next, check for missing commas between numbers. Reading data from a page of a magazine can be a strain on the brain, so use a ruler or a piece of paper or anything else to help you keep track of where you are as you enter the data.

Other Problems

It is important to remember that the 64 and the PET/CBM computers will only accept a line up to 80 characters long. The VIC 20 will accept a line up to 88 characters long and the 128 a line up to 160 characters long. Sometimes you will find a line in a program that runs over this number of characters. This is not a mistake in the listing. Sometimes programmers get so carried away crunching programs that they use abbreviated commands to get more than the standard number of characters on one line.

 "[HOME]" = UNSHIFTED CLR/HOME	 "[PURPLE]" = CONTROL 5	 "[F1]" = F1
 "[CLEAR]" = SHIFTED CLR/HOME	 "[GREEN]" = CONTROL 6	 "[F2]" = F2
 "[DOWN]" = CURSOR DOWN	 "[BLUE]" = CONTROL 7	 "[F3]" = F3
 "[UP]" = CURSOR UP	 "[YELLOW]" = CONTROL 8	 "[F4]" = F4
 "[RIGHT]" = CURSOR RIGHT	 "[ORANGE]" = COMMODORE 1	 "[F5]" = F5
 "[LEFT]" = CURSOR LEFT	 "[BROWN]" = COMMODORE 2	 "[F6]" = F6
 "[RVS]" = CONTROL 9	 "[L. RED]" = COMMODORE 3	 "[F7]" = F7
 "[RVOFF]" = CONTROL 0	 "[GRAY1]" = COMMODORE 4	 "[F8]" = F8
 "[BLACK]" = CONTROL 1	 "[GRAY2]" = COMMODORE 5	 "[POUND]" = ENGLISH
 "[WHITE]" = CONTROL 2	 "[L. GREEN]" = COMMODORE 6	 "[SHFT ^]" = PI SYMBOL
 "[RED]" = CONTROL 3	 "[L. BLUE]" = COMMODORE 7	 "[^]" = UP ARROW
 "[CYAN]" = CONTROL 4	 "[GRAY3]" = COMMODORE 8	

GRAPHIC SYMBOLS WILL BE REPRESENTED AS EITHER THE LETTERS SHFT (SHIFT) AND A KEY ("[SHFT Q,SHFT J,SHFT D,SHFT S]") OR THE LETTERS CMDR (COMMODORE) AND A KEY ("[CMDR Q,CMDR G,CMDR Y,CMDR H]"). IF A SYMBOL IS REPEATED, THE NUMBER OF REPETITIONS WILL BE DIRECTLY AFTER THE KEY AND BEFORE THE COMMA ("[SPACE3,SHFT S4,CMDR M2]").

HOW TO ENTER PROGRAMS

You can enter these lines by abbreviating the commands when you enter the line. The abbreviations for BASIC commands are in your user guide.

If you type a line that is longer than the acceptable number of characters, the computer will act as if everything is ok, until you press RETURN. Then, a syntax error will be displayed (without a line number). Many people write that the computer gives them a syntax error when they type the line, or that the computer refuses to accept a line. Both of these problems are results of typing a line that has too many characters.

The Program Won't Run!!

This is the hardest of problems to resolve; no error message is displayed, but the program just doesn't run. This can be caused by many small mistakes typing a program in. First check that the program was written for the computer you are using. Check to see if you have left out any lines of the program. Check each

line of the program for typos or missing parts. Finally, press the RUN/STOP key while the program is "running." Write down the line the program broke at and try to follow the program backwards from this point, looking for problems.

If All Else Fails

You've come to the end of your rope. You can't get the program to run and you can't find any errors in your typing. What do you do? As always, we suggest that you try a local user group for help. In a group of even just a dozen members, someone is bound to have typed in the same program. The user group may also have the program on a library disk and be willing to make a copy for you. For \$9.95 per issue, you can also get all the BASIC programs in each issue, as well, from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007.

If you do get a working copy, be sure to compare it to your own version so that you can learn from your

errors and increase your understanding of programming.

If you live in the country, don't have a local user group, or you simply can't get any help, write to us. If you do write to us, include the following information about the program you are having problems with:

The name of the program

The issue of the magazine it was in

The computer you are using

Any error messages and the line numbers

Anything displayed on the screen

A printout of your listing (if possible)

All of this information is helpful in answering your questions about why a program doesn't work. A letter that simply states "I get an error in line 250 whenever I run the program" doesn't give us much to go on. Send your questions to:

Commodore Magazines

1200 Wilson Drive

West Chester, PA 19380

ATTN: Program Problem



HOW TO USE THE MAGAZINE ENTRY PROGRAMS

The Magazine Entry Programs on the next pages are two BASIC machine language programs that will assist you in entering the programs in this magazine correctly. There are versions for both the Commodore 64 and the Commodore 128. Once the program is in place, it works its magic without you having to do anything else. The program will not let you enter a line if there is a typing mistake on it, and better yet, it identifies the kind of error for you.

Getting Started

Type in the Magazine Entry Program carefully and save it as you go along (just in case). Once the whole program is typed in, save it again on tape or disk. Now RUN the program. The word POKING will appear on the top of the screen with a number. The number will increment from 49152 up to 49900 (4864-5545 on the 128) and just lets you know that the program is running. If everything is ok, the program will finish running and say DONE. Then type NEW. If there is a problem with the data statements,

the program will tell you where to find the problem. Otherwise the program will say "mistake in data statements." Check to see if commas are missing, or if you have used periods instead of commas. Also check the individual data items.

Once the program has run, it is in memory ready to go. To activate the program type SYS49152 (SYS4864 on the 128), and press RETURN. You are now ready to enter the programs from the magazine. To disable the Entry Program, just type KILL (RETURN) on the 64 or SYS4867 on the 128.

The checksums for each line are the same for both the 64 and 128, so you can enter your 64 programs on the 128 if you'd like.

Typing the Programs

All the BASIC program listings in this magazine that are for the 64 or 128 have an apostrophe followed by four letters at the end of the line (e.g., 'ACDF). If you plan to use the Magazine Entry Program to enter your programs, the apostrophe and letters should be entered along with the

rest of the line. This is a checksum that the Magazine Entry Program uses.

Enter the line and the letters at the end and then press RETURN, just as you normally would.

If the line is entered correctly, a bell is sounded and the line is entered into the computer's memory (without the characters at the end).

If a mistake was made while entering the line, a noise is sounded and an error message is displayed. Read the error message, then press any key to erase the message and correct the line.

IMPORTANT

If the Magazine Entry Program sees a mistake on a line, it **does not** enter that line into memory. This makes it impossible to enter a line incorrectly.

Error Messages and What They Mean

There are five error messages that the Magazine Entry Program uses. Here they are, along with what they mean and how to fix them.

Continued next page

HOW TO USE THE MAGAZINE ENTRY PROGRAMS

NO CHECKSUM: This means that you forgot to enter the apostrophe and the four letters at the end of the line. Move the cursor to the end of the line you just typed and enter the checksum.


QUOTE: This means that you forgot (or added) a quote mark somewhere in the line. Check the line in the magazine and correct the quote.

KEYWORD: This means that you have either forgotten a command or spelled one of the BASIC keywords (GOTO, PRINT, ...) incorrectly. Check

the line in the magazine again and check your spelling.

OF CHARACTERS: This means that you have either entered extra characters or missed some characters. Check the line in the magazine again. This error message will also occur if you misspell a BASIC command, but create another keyword in doing so. For example, if you misspell PRINT as PRONT, the 64 sees the letter P and R, the BASIC keyword ON and then the letter T. Because it sees the keyword ON, it thinks you've got too

many characters, instead of a simple misspelling. Check spelling of BASIC commands if you can't find anything else wrong.

UNIDENTIFIED: This means that you have either made a simple spelling error, you typed the wrong line number, or you typed the checksum incorrectly. Spelling errors could be the wrong number of spaces inside quotes, a variable spelled wrong, or a word misspelled. Check the line in the magazine again and correct the mistake. 

MAGAZINE ENTRY PROGRAM-64

The Magazine Entry Programs are available on disk, along with the other programs in this magazine, for \$9.95. To order, contact Loadstar at 1-800-831-2694.

```
10 PRINT"[CLEAR]POKING -";
20 P=49152:REM $C000 (END AT
   49900/$C2EC)
30 READ A$:IF A$="END"THEN 110
40 L=ASC(MID$(A$,2,1))
50 H=ASC(MID$(A$,1,1))
60 L=L-48:IF L>9 THEN L=L-7
70 H=H-48:IF H>9 THEN H=H-7
80 PRINT"[HOME,RIGHT12]"P;
90 IF H>15 OR L>15 THEN PRINT
   :PRINT"DATA ERROR IN LINE";
   1000+INT((P-49152)/8):STOP
100 B=H*16+L:POKE P,B:T=T+B:P=P+1
   :GOTO 30
110 IF T<>86200 THEN PRINT
   :PRINT"MISTAKE IN DATA --> CHECK
   DATA STATEMENTS":END
120 PRINT"DONE":END
1000 DATA 4C,1F,C0,00,00,00,00,00
1001 DATA 00,00,00,00,00,00,0D,00,21
1002 DATA C1,27,C1,2F,C1,3F,C1,4C
1003 DATA C1,EA,EA,EA,4C,54,C0,A2
1004 DATA 05,BD,19,C0,95,73,CA,10
1005 DATA F8,60,60,A0,03,B9,00,02
1006 DATA D9,04,C1,D0,F5,88,10,F5
1007 DATA A0,05,B9,A2,E3,99,73,00
1008 DATA 88,10,F7,A9,00,8D,18,D4
1009 DATA 4C,EF,C0,E6,7A,D0,02,E6
1010 DATA 7B,4C,79,00,A5,9D,F0,F3
1011 DATA A5,7A,C9,FF,D0,ED,A5,7B
1012 DATA C9,01,D0,E7,20,2B,C0,AD
1013 DATA 00,02,20,74,C0,90,DC,A0
1014 DATA 00,4C,A9,C1,C9,30,30,06
1015 DATA C9,3A,10,02,38,60,18,60
1016 DATA C8,B1,7A,C9,20,D0,03,C8
1017 DATA D0,F7,B1,7A,60,18,C8,B1
1018 DATA 7A,F0,37,C9,22,F0,F5,6D
1019 DATA 03,C0,8D,03,C0,AD,04,C0
1020 DATA 69,00,8D,04,C0,4C,8E,C0
1021 DATA 18,6D,05,C0,8D,05,C0,90
1022 DATA 03,EE,06,C0,EE,09,C0,4C
1023 DATA CE,C1,18,6D,08,C0,8D,08
1024 DATA C0,90,03,EE,07,C0,EE,0A
```

```
1025 DATA C0,60,0A,A8,B9,0F,C0,85
1026 DATA FB,B9,10,C0,85,FC,A0,00
1027 DATA A9,12,20,D2,FF,B1,FB,F0
1028 DATA 06,20,D2,FF,C8,D0,F6,20
1029 DATA BC,C2,20,E4,FF,F0,FB,A0
1030 DATA 18,B9,08,C1,20,D2,FF,88
1031 DATA 10,F7,68,68,A9,00,8D,00
1032 DATA 02,4C,74,A4,4B,49,4C,4C
1033 DATA 91,91,0D,20,20,20,20,20
1034 DATA 20,20,20,20,20,20,20,20
1035 DATA 20,20,20,20,20,20,20,91
1036 DATA 0D,51,55,4F,54,45,00,4B
1037 DATA 45,59,57,4F,52,44,00,23
1038 DATA 20,4F,46,20,43,48,41,52
1039 DATA 41,43,54,45,52,53,00,55
1040 DATA 4E,49,44,45,4E,54,49,46
1041 DATA 49,45,44,00,4E,4F,20,43
1042 DATA 48,45,43,4B,53,55,4D,00
1043 DATA C8,B1,7A,D0,FB,84,FD,C0
1044 DATA 09,10,03,4C,84,C1,88,88
1045 DATA 88,88,88,B1,7A,C9,27,D0
1046 DATA 13,A9,00,91,7A,C8,A2,00
1047 DATA B1,7A,9D,3C,03,C8,E8,E0
1048 DATA 04,D0,F5,60,A9,04,4C,CA
1049 DATA C0,A0,00,B9,00,02,99,40
1050 DATA 03,F0,F0,C8,D0,F5,A0,00
1051 DATA B9,40,03,F0,E6,99,00,02
1052 DATA C8,D0,F5,20,96,C1,4C,12
1053 DATA C2,A0,09,A9,00,99,03,C0
1054 DATA 8D,3C,03,88,10,F7,A9,80
1055 DATA 85,02,A0,00,20,58,C1,20
1056 DATA 89,C1,20,ED,C1,E6,7A,E6
1057 DATA 7B,20,7C,A5,A0,00,20,80
1058 DATA C0,F0,D0,24,02,F0,06,4C
1059 DATA A8,C0,4C,CE,C1,C9,22,D0
1060 DATA 06,20,8D,C0,4C,CE,C1,20
1061 DATA BA,C0,4C,CE,C1,A0,00,B9
1062 DATA 00,02,20,74,C0,C8,90,0A
1063 DATA 18,6D,07,C0,8D,07,C0,4C
1064 DATA EF,C1,88,A2,00,B9,00,02
1065 DATA 9D,00,02,F0,04,E8,C8,D0
1066 DATA F4,60,18,AD,09,C0,69,41
1067 DATA 8D,09,C0,38,AD,0A,C0,E9
1068 DATA 19,90,06,8D,0A,C0,4C,1C
1069 DATA C2,AD,0A,C0,69,41,8D,0A
```

```

1070 DATA C0,AD,03,C0,6D,05,C0,48
1071 DATA AD,04,C0,6D,06,C0,8D,0C
1072 DATA C0,68,6D,08,C0,8D,0B,C0
1073 DATA AD,0C,C0,6D,07,C0,8D,0C
1074 DATA C0,38,E9,19,90,06,8D,0C
1075 DATA C0,4C,52,C2,AD,0C,C0,69
1076 DATA 41,8D,0C,C0,AD,0B,C0,E9
1077 DATA 19,90,06,8D,0B,C0,4C,67
1078 DATA C2,AD,0B,C0,69,41,8D,0B
1079 DATA C0,A0,01,AD,09,C0,CD,3C
1080 DATA 03,D0,20,C8,AD,0A,C0,CD
1081 DATA 3D,03,D0,17,C8,AD,0B,C0

```

```

1082 DATA CD,3E,03,D0,0E,AD,0C,C0
1083 DATA CD,3F,03,D0,06,20,CC,C2
1084 DATA 4C,4B,C0,98,48,68,4C,CA
1085 DATA C0,A9,20,8D,00,D4,8D,01
1086 DATA D4,A9,09,8D,05,D4,A9,0F
1087 DATA 8D,18,D4,60,20,A9,C2,A9
1088 DATA 81,20,DF,C2,A9,80,20,DF
1089 DATA C2,4C,D9,C2,20,A9,C2,A9
1090 DATA 11,20,DF,C2,A9,10,20,DF
1091 DATA C2,A9,00,8D,04,D4,60,8D
1092 DATA 04,D4,A2,70,A0,00,88,D0
1093 DATA FD,CA,D0,FA,60,END

```

END

MAGAZINE ENTRY PROGRAM-128

```

5 TRAP 200
10 PRINT"[CLEAR]POKING -";
20 P=4864:REM $1300 (END AT
5545/$15A9)
30 READ A$:IF A$="END"THEN 110
80 PRINT"[HOME,RIGHT12]"P;
100 B=DEC(A$):POKE P,B:T=T+B:P=P+1
:GOTO 30
110 IF T<>59314 THEN PRINT
:PRINT"MISTAKE IN DATA --> CHECK
DATA STATEMENTS":END
120 PRINT"DONE":END
200 PRINT:PRINT"DATA ERROR IN LINE";
1000+INT((P-4864)/8):END
1000 DATA 4C,1E,13,4C,3A,13,00,00
1001 DATA 8E,00,F7,00,42,41,51,57
1002 DATA 0D,00,0D,43,08,14,0E,14
1003 DATA 16,14,26,14,33,14,A9,00
1004 DATA 8D,00,FF,AD,04,03,8D,12
1005 DATA 13,AD,05,03,8D,13,13,A2
1006 DATA 4A,A0,13,8E,04,03,8C,05
1007 DATA 03,60,AD,12,13,8D,04,03
1008 DATA AD,13,13,8D,05,03,60,6C
1009 DATA 12,13,A5,7F,D0,F9,AD,00
1010 DATA 02,20,5B,13,90,F1,A0,00
1011 DATA 4C,6F,14,C9,30,30,06,C9
1012 DATA 3A,10,02,38,60,18,60,C8
1013 DATA B1,3D,C9,20,D0,03,C8,D0
1014 DATA F7,B1,3D,60,18,C8,B1,3D
1015 DATA F0,35,C9,22,F0,F5,6D,06
1016 DATA 13,8D,06,13,AD,07,13,69
1017 DATA 00,8D,07,13,4C,75,13,18
1018 DATA 6D,08,13,8D,08,13,90,03
1019 DATA EE,09,13,EE,0C,13,60,18
1020 DATA 6D,0B,13,8D,0B,13,90,03
1021 DATA EE,0A,13,EE,0D,13,60,0A
1022 DATA A8,B9,14,13,85,FB,B9,15
1023 DATA 13,85,FC,A0,00,8C,00,FF
1024 DATA A9,12,20,D2,FF,B1,FB,F0
1025 DATA 06,20,D2,FF,C8,D0,F6,20
1026 DATA 79,15,20,A3,15,20,E4,FF
1027 DATA F0,FB,A0,1B,B9,EF,13,20
1028 DATA D2,FF,88,10,F7,68,68,A9
1029 DATA 00,8D,00,02,4C,B7,4D,91
1030 DATA 91,0D,20,20,20,20,20,20
1031 DATA 20,20,20,20,20,20,20,20
1032 DATA 20,20,20,20,20,20,91,0D
1033 DATA 51,55,4F,54,45,00,4B,45
1034 DATA 59,57,4F,52,44,00,23,20
1035 DATA 4F,46,20,43,48,41,52,41

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```

1036 DATA 43,54,45,52,53,00,55,4E
1037 DATA 49,44,45,4E,54,49,46,49
1038 DATA 45,44,00,4E,4F,20,43,48
1039 DATA 45,43,4B,53,55,4D,00,C8
1040 DATA B1,3D,D0,FB,C0,09,10,03
1041 DATA 4C,69,14,88,88,88,88,88
1042 DATA B1,3D,C9,27,D0,13,A9,00
1043 DATA 91,3D,C8,A2,00,B1,3D,9D
1044 DATA 00,0B,C8,E8,E0,04,D0,F5
1045 DATA 60,4C,5C,15,4C,C5,14,A0
1046 DATA 09,A9,00,99,06,13,8D,00
1047 DATA 0B,88,10,F7,A9,80,85,FD
1048 DATA A0,00,20,3F,14,20,AE,14
1049 DATA 20,0D,43,84,FA,A0,FF,20
1050 DATA 67,13,F0,D8,24,FD,F0,06
1051 DATA 20,8F,13,4C,8F,14,C9,22
1052 DATA D0,06,20,74,13,4C,8F,14
1053 DATA 20,9F,13,4C,8F,14,C0,00
1054 DATA B9,00,02,20,5B,13,C8,90
1055 DATA 0A,18,6D,0A,13,8D,0A,13
1056 DATA 4C,B0,14,88,60,18,AD,0C
1057 DATA 13,69,41,8D,0C,13,38,AD
1058 DATA 0D,13,E9,19,90,06,8D,0D
1059 DATA 13,4C,CF,14,AD,0D,13,69
1060 DATA 41,8D,0D,13,AD,06,13,6D
1061 DATA 08,13,48,AD,07,13,6D,09
1062 DATA 13,8D,0F,13,68,6D,0B,13
1063 DATA 8D,0E,13,AD,0F,13,6D,0A
1064 DATA 13,8D,0F,13,38,E9,19,90
1065 DATA 06,8D,0F,13,4C,05,15,AD
1066 DATA 0F,13,69,41,8D,0F,13,AD
1067 DATA 0E,13,E9,19,90,06,8D,0E
1068 DATA 13,4C,1A,15,AD,0E,13,69
1069 DATA 41,8D,0E,13,A0,01,AD,0C
1070 DATA 13,CD,00,0B,D0,20,C8,AD
1071 DATA 0D,13,CD,01,0B,D0,17,C8
1072 DATA AD,0E,13,CD,02,0B,D0,0E
1073 DATA AD,0F,13,CD,03,0B,D0,06
1074 DATA 20,89,15,A4,FA,60,98,48
1075 DATA 68,4C,AF,13,A9,04,4C,AF
1076 DATA 13,A9,00,8D,00,FF,A9,20
1077 DATA 8D,00,D4,8D,01,D4,A9,09
1078 DATA 8D,05,D4,A9,0F,8D,18,D4
1079 DATA 60,20,61,15,A9,81,20,9C
1080 DATA 15,A9,80,20,9C,15,4C,96
1081 DATA 15,20,61,15,A9,11,20,9C
1082 DATA 15,A9,10,20,9C,15,A9,00
1083 DATA 8D,04,D4,60,8D,04,D4,A2
1084 DATA 70,A0,00,88,D0,FD,CA,D0
1085 DATA FA,60,END

```

END

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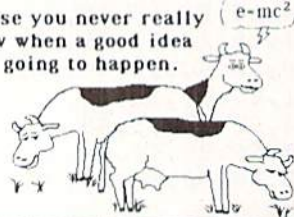
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WORD WRITER

Continued from pg. 54

gram disk, and wait. When the dictionary is finished checking your document, it will reappear on the screen with suspected words highlighted. The cursor will stop at each suspected spelling error so you can either leave the word as is, change it, or scroll through the words in the dictionary until you spot the correct spelling. When the proper spelling is found, a single keystroke will replace the misspelled word.

A five-function calculator is built into the system and can be displayed on the screen by simply pressing the Commodore key and F3. The display looks and responds like a small handheld calculator, and the results can be transferred into your document. Anyone who has to include price quotes, inventory count, or any math results in their correspondence will appreciate this handy aid.

Unfortunately, *Word Writer 128* reads and writes sequential files only. This is a fact to consider if you are a 64 owner moving up to the 128 and want a word processor that can read the files created by your 64 word processor. If you use a word processor like *Easy Script* which stores sequential files, you can load them into *Word Writer 128*, make a few changes, then either re-save them as *Word Writer 128* files or dump them to your printer. But if you now use a word processor like *WordPro* or *Write Now!*, which uses program files, you'll have to re-key any files you want to transfer.

There is also no option to preview a document on-screen before dumping it to the printer. Without this it is impossible to know where pages break when using mixed-line spacing. You also can't be sure that your headers and footers are displayed properly.

However, the many features included in *Word Writer 128* overshadow the two missing. The program's logical design, help screens, realistic screen display, multiple printer support and well written manual, plus the handy calculator and spell-checker program make *Word Writer 128* an excellent buy. Add to this Timeworks' free technical support for registered users and a fair upgrade and exchange policy. If you are a 128 owner looking for a word processor, you'll find *Word Writer 128* an excellent product at an affordable price.

KUNG FU

Continued from pg. 28

plex as a tucked-back somersault followed by a paralyzing roundhouse kick; all executed with such precision and grace that it will make your opponent's head spin...or his ribs ache...or his stomach hurt.

Each confrontation is a timed event with scoring. Depending upon a move's difficulty and execution, either a half or full point is awarded to the fighter who successfully immobilizes his opponent. The first contender to reach two points wins the bout. If time expires with no clear-cut winner, a judge will award victory to the fighter with the best performance.

Contrasting the foreground's directed physical drama is a serene oriental backdrop. The landscape, art and structures familiar to Japan are well represented in a series of diverse, colorful scenes. Play fields are decorated with pagodas, ornamental paper lanterns, spurge, pink blossoms, religious statues, and of course, the forever majestic Fujiyama. And common to each scene is the seated figure of the Dark Master himself, patiently waiting for you to meet your match.

The program's sound effects complement the visuals. Behind the realistic smacks of flesh-meeting-flesh and the anguished groans of injured fighters, the unmistakable song of a stringed koto filters through, spreading a melodious cloak of hypnotic tranquility over the death blows being dealt at center stage.

As head-to-head karate contests go, *Kung Fu* not only delivers top-quality arcade action, but also strives to capture every nuance of sight and sound. There's even a two-player option that lets you give and take your licks opposite a friend.

The only problem I encountered with the program is that it lacks a definitive conclusion. When you are finally skilled and lucky enough to beat the tenth opponent, you will be rewarded with...nothing. No fanfare, no animated emancipation, no extra life, nothing. Instead, you will continue to face a rejuvenated final foe until you inevitably fatigue, slip, and lose your life. After hours of practice, that kind of finish can be a little disappointing. But the game still stands strong as fast-paced, well designed, and highly recommended entertainment.

TOUCHDOWN FOOTBALL

Continued from pg. 18

ty. During passing, offensive control switches to the designated receiver at the moment the ball is released. Approaching the line of scrimmage, the quarterback can either call an audible or receive the hike. Audibles give both sides the opportunity to select all new plays.

Following the snap of the ball, the quarterback has the choice of fading back for the pass or attempting a run. Since handoffs are not included in the game, the quarterback must fend for himself. Successful running plays must be initiated quickly, before the computer-controlled defense breaks free from the offensive line.

Passing the ball (and actually catching it) has long been a sore point with many computer football fans. Fortunately, this is one area where *Touchdown Football* really shines. Pass completions are so easy that the pressure is placed where it belongs: on the defense. It becomes a skillful battle of wits, timing and strategic maneuvering. This is one of the few computer football games that allows

the quarterback to pass while in motion. This presents a double threat to the defense. Although there are no fumbles, interceptions are painfully real.

Sound effects are traditionally sparse for computer football games. Other than a rousing football theme played during kickoffs, sound effects for this game are limited to audio feedback for pass completions, interceptions, hikes, kicks, referee whistles and cheering crowds.

Although the computer team is programmed to give you a tough fight during solitaire contests, with enough practice it can be beaten most of the time. *Touchdown Football* really comes to life as a two-player game. Vast strategic possibilities and ease of play make this one of the best competitive sports games on the market.

Successfully running the ball is a matter of joystick finesse and timing. Immediately after the ball is hiked, move the quarterback directly to either side line. When he is beyond the offensive pile-up, cut across the line

of scrimmage at a 45-degree angle to the outside. Approaching the edge of the field, straighten out and straddle the side line. The amount of yardage gained will depend on which side of the defensive formation you run to.

Use this same technique for potentially long punt and kickoff returns. Watch your blockers and how they engage the oncoming defenders. The key once again is to cut *diagonally* against the defensive grain. Kick returns for touchdowns are entirely possible.

While on defense, use the blitz with caution. The computer-controlled defensive line is fast and rarely needs your help. If you over-commit yourself trying to sack the quarterback, he can burn you with a long pass to his open receivers.

Touchdown Football is one of the most entertaining computer sports games available today. It is clearly the best action-oriented football game ever conceived for the home computer. Strap on your helmet, gridiron gladiator, the crowd awaits. **G**

TITLE BOUT

Continued from pg. 56

take too many fights against big hitters like George Foreman, Earnie Shavers or Rocky Marciano to understand how judicious use of these options can keep a fighter from feeling the canvas against his face.

The first step in beginning a fight is to select the boxers. There are 121 heavyweights, 69 light heavies, 72 middleweights, 60 welterweights, 57 lightweights, 50 featherweights, 40 bantams, and 40 flyweights. Once you've selected the two combatants, two screen displays will provide information on each fighter.

Early on in the game, it's a good idea to take the rule book and go over step-by-step exactly what each of the ratings means and how it can affect the fight. Then watch for those ratings to change during the course of the fight. You'll get a chance to see them after each round and a sharp eye will pick up different ways that strategies might be used.

One thing that gives *Title Bout* such a realistic feel is the control factor for each fighter. When a round

starts, the player with the highest aggressiveness rating has the best chance to throw the first punch. His control rating then comes into play. As long as the random number generated is within his control factor range, he will be the one throwing punches and inflicting damage. Once that number falls outside his range, the other boxer gets his chance. This feature of the game keeps the bout from becoming merely a random trading of punches.

Another feature that makes *Title Bout* so realistic is the technical knockout factor. This rating tells how much punishment a boxer can absorb, not just in one round, but in two successive rounds. Cuts sustained in the fight happen with believable frequency, as do other kinds of injuries. I played 35 fights in testing the game and had only two such major injuries, so they don't happen often. But when they do, they do have an impact on the effectiveness of the fighter—whether it be a broken nose, broken jaw, or broken hand.

Another realistic feature is the fouls. Most fighters never have a serious foul that costs them the fight, but many times a fighter will get warned. Some of the older boxers in the game will foul more frequently.

After each round, you get not only a statistical summary of your fighter's current status, but also a review of the scoring by the two judges and the referee on that round. In close rounds, a judge might call it even, but in some cases, the judges' scores will be replaced by "???" This means that you won't know until the bout is over to whom the judge awarded the round.

Graphically, the game doesn't garner any awards. The ring representation of the fighters is a little better than stick-men, and the sound effects are more of a distraction than a help. But whatever the game looks like or sounds like, it "feels" like boxing and is accurate in almost every detail. Take my word for it, pugilistic satisfaction can be found inside this square circle. **G**

Video Digitizer

Computer: Commodore 64
Manufacturer: Kinney Software
 121 N. Hampton Road
 Donnelsville, OH
 45319
Price: \$39.95 (Includes circuit board, instructions and software. Video camera and electronic parts not included.)

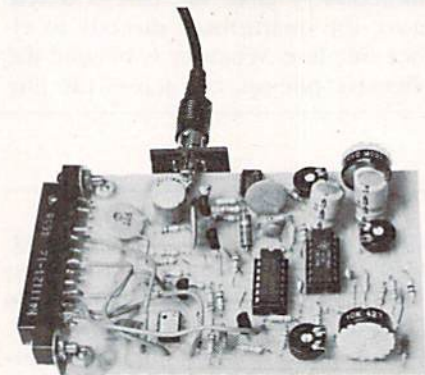
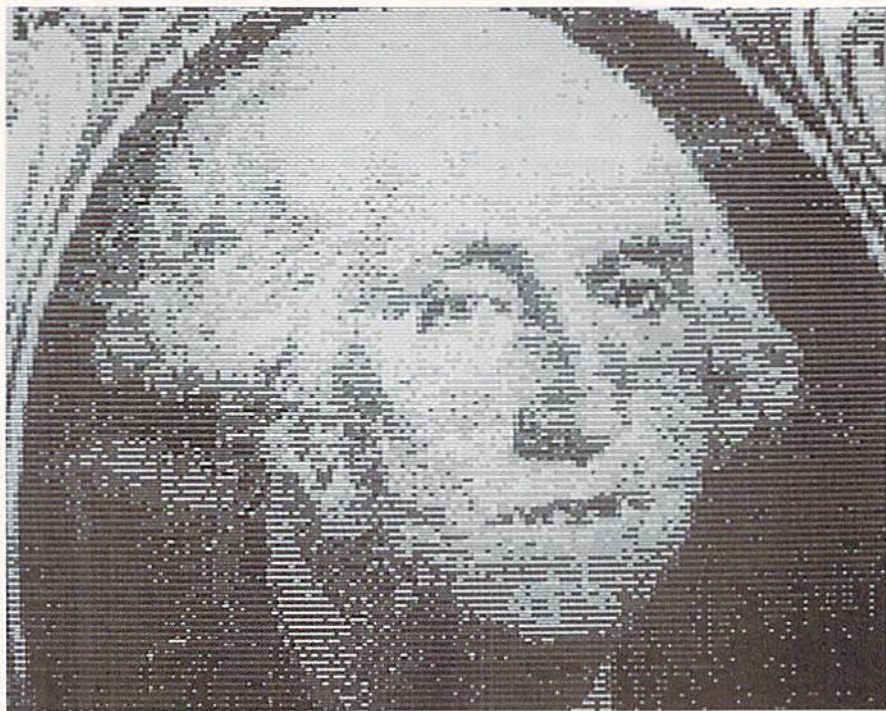
A video digitizer is an electronic device that converts a picture from a video camera or other source into something that can be displayed on a graphics screen. Without a video digitizer, you have to laboriously draw the picture using either a graphics tablet, a light pen with graphics software, or a trackball or joystick. But with a video digitizer, you merely have to take a picture—it will be faithfully reproduced on your screen.

The video digitizers on the market for the Commodore 64 have been pricey—\$200 or more—and even then you have to find a store that carries them. So you can imagine my interest when I saw a press release for Kinney Software's Video Digitizer for the Commodore 64 at only \$39.95! I wasted no time in placing my order.

As you'd expect, a \$39.95 digitizer can't give you the same things a \$200 digitizer can. The most obvious difference is that the Kinney Software unit doesn't include a video camera, the most expensive component. (At that price, nobody would expect it to.)

The software comes with a small, pre-drilled circuit board. All the holes are drilled for the components called for in the parts list; I only had to bend the legs of one of the trim pots to get it to fit. The board uses parts available at the local Radio Shack. (Impatient types like me hate to send away for parts.) The only part not available from Radio Shack is the edge connector that connects the digitizer board to the user port of the 64. (Or a 128 in 64 mode—I've tested it with both.)

I didn't use the connector called for in the parts list, because I had an



The Kinney Video Digitizer displays its pictures in high-resolution multicolor mode using the Commodore 64's four shades of gray to represent the gray scale of a black-and-white photograph.

old one left over from my project-building days with my Commodore PET. This I mounted to the board

with a Rube Goldberg collection of nuts, bolts and old Erector® set parts. So far it's given me no problem, but using the more substantial connector called for in the parts list will give you a stronger unit.

An RCA (phone-type) female jack is used for the video input. No part number for this was mentioned in the parts list, but I had an old one left over from my sound-effects project days. You'll have to spend about \$25 for the parts required to build the digitizer.

As you might guess from the above, I've had some experience with electronic assembly. And it was well that I did. If I were a teacher grading this product, I'd give the software and board design an A and the assembly instructions a D. You have to figure out your parts placement from a pair of hand-drawn pictures of the board, and a badly-photocopied photograph. A full schematic is included, but will prove useful only to those who can understand it. Clear instructions for wiring the edge connector were especially missed; this part would definitely throw a beginner who is just figuring out which end of the soldering iron is hot. If you haven't done much work with electronics, better have a friend nearby who has.

The Kinney digitizer displays its

HARDWARE REVIEWS



pictures in high-resolution multicolor mode using the Commodore 64's four shades of gray to represent the gray scale of a black-and-white photograph. The software allows you to change these default colors if you wish. For example, the program includes the suggested color changes to simulate an old-fashioned sepia tone print.

You may also process the incoming video with any number of gray levels from two to eight. The Commodore 64 can't display all of those shades, but the digitizer board and software can recognize and process them. This is especially useful when the digitized picture is saved on disk in a "regular" 320 x 200 high-resolution (not multicolor) format. The two-gray-scale processing gives good contrast.

The Kinney video software allows you to save your digitized picture to disk in one of four formats.

1. The Kinney "standard" format. Use this especially if you wish to reload the picture with the Kinney software. It is saved in multicolor mode.

2. KoalaPad-compatible format. This format lets you load and modify a digitized picture using Koala Technology's KoalaPad. It is saved in multicolor mode. If you choose to digitize your picture with three levels of gray instead of four, you will have one color "left over" for more flexibility.

3. *Doodle!*-compatible format. This format saves your digitized picture with the same graphics mode and loading addresses used by City Software's *Doodle!*. It is saved in high-resolution mode (320x200). The gray



scales are simulated in high-resolution mode by the different spacings of vertical lines, and the effect is quite good. Processing the video signal with seven gray levels seems to produce the best high-resolution picture.

4. *Print Shop*-compatible format. This format saves your picture with the same loading addresses used by Broderbund Software's *Print Shop*. It is saved in high-resolution mode.

If you have access to a video camera and don't mind scrounging parts and assembling it yourself, the Kinney Software Video Digitizer for the Commodore 64 is a real bargain.

Ed. Note: In response to the review, Kinney Software has added a connector diagram and improved layout quality in the assembly instructions.



128 Games

HP Books has released **35 Amazing Games for Your 128**, a book that offers 35 arcade, board and educational games to type in. Written in Commodore 128 BASIC 7.0, the book offers suggestions for creating challenging variations in the programs: speed games up or slow them down, make the game easier or more difficult, use different colors or different sounds. The book retails for \$9.95 plus \$1.95 postage and handling. (HP Books, Box 5367, Tucson, AZ 85703)

Write Your Will Right

Nolo Press has released **WillWriter** for the Commodore 64/128, a book/software package that helps write simple, legally binding personal wills. It was developed as a practical and inexpensive way to avoid becoming part of the 66% of adult Americans who, according to **Consumer Reports**, die without leaving a will.

The 170-page book explains the legal concepts and conditions involved in making a will. It also provides information on important aspects of estate planning, including trusts and probate avoidance methods. The software leads the user through each section of the will. On-screen help prompts and fill-in-the-blank questions make writing a will simple. **WillWriter** also allows users to change and update their wills, avoiding the expense and hassle of visiting a law office.

WillWriter is available for \$39.95 with a 30-day money-back warranty. Nolo Press keeps users abreast of any changes in the law and enhancements of the program. (Nolo Press, 950 Parker Street, Berkeley, CA 94710)

Disk Organizer

Diskorganizer from the G.A.S.S. Company sorts and rearranges the disk directory of any unprotected Commodore 64 disk, and the new directory is written back onto the disk. Using a screen editor, you can change the header, scratch files, copy files of any size to another disk, rename files, add "fences" to mark off sections of the disk, "scratch-protect" any files, position individual files anywhere in the directory, and print out copies of your revised directories. You may also rename the header or use the wedge for common disk commands.

Diskorganizer for the Commodore 64 retails for \$29.95. (The G.A.S.S. Company, 970 Copeland, North Bay, Ontario, P1B 3E4, Canada)

Bowling Simulator

Access Software has released **Tenth Frame**, a bowling simulator for the Commodore 64/128. **Tenth Frame** includes features like 3D animation, multiple levels of play, and league competition which allows up to eight bowlers. Other features are computerized scoring, lifelike sound effects, and realistic graphics. **Tenth Frame** retails for \$39.95. (Access Software, 2561 South 1560 West, Woods Cross, UT 84087)

Hardware Connections

Master Software has announced four new products for Commodore computers: Modem Master, Modem Master Plus, Y-Not? and the 80 Mono Cable.

Modem Master is a four-foot extender for the user port (modem port) on the VIC 20, Commodore 64, SX-64, Plus/4 and Commodore 128, allowing the computer owner to place user port devices in locations more convenient than behind the computer. It also permits the use of user port devices which otherwise wouldn't fit due to the plastic housings, such as the 1650 AutoModem on the SX-64.

Modem Master includes four feet of tangle-proof ribbon cable and connectors which are keyed to prevent incorrect installation. List price of Modem Master is \$29.95.

Modem Master Plus includes all the features of Modem Master, plus a system reset switch that will reset the Commodore 64, SX-64, and VIC 20 in case of computer lock-up. The reset switch is buffered to prevent electrical damage to your computer, and will recover the BASIC program that was in memory at the time of lockup. Modem Master Plus retails for \$34.95.

Y-Not? is a six-foot long "Y" cable for the six-pin serial port of all Commodore computers. Y-Not? contains one male six-pin plug and two female six-pin jacks, and can be used to operate two printers or to separate the disk drive and printer to opposite sides of the computer set-up for added system flexibility. Y-Not? retails for \$15.

The 80 Mono Cable will produce an 80-column monochrome display from the Commodore 128 in 80-column mode on any composite color monitor or monochrome monitor. It is six feet long and plugs into the RGBI port of the computer and into the video input jack of the monitor. The 80 Mono Cable retails for \$9. It allows you to use your Commodore 128's 80-column mode without buying an RGB monitor. (Master Software, 6 Hillery Court, Randallstown, MD 21133)

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___	TC600 (D)	The Hulk	\$21.00
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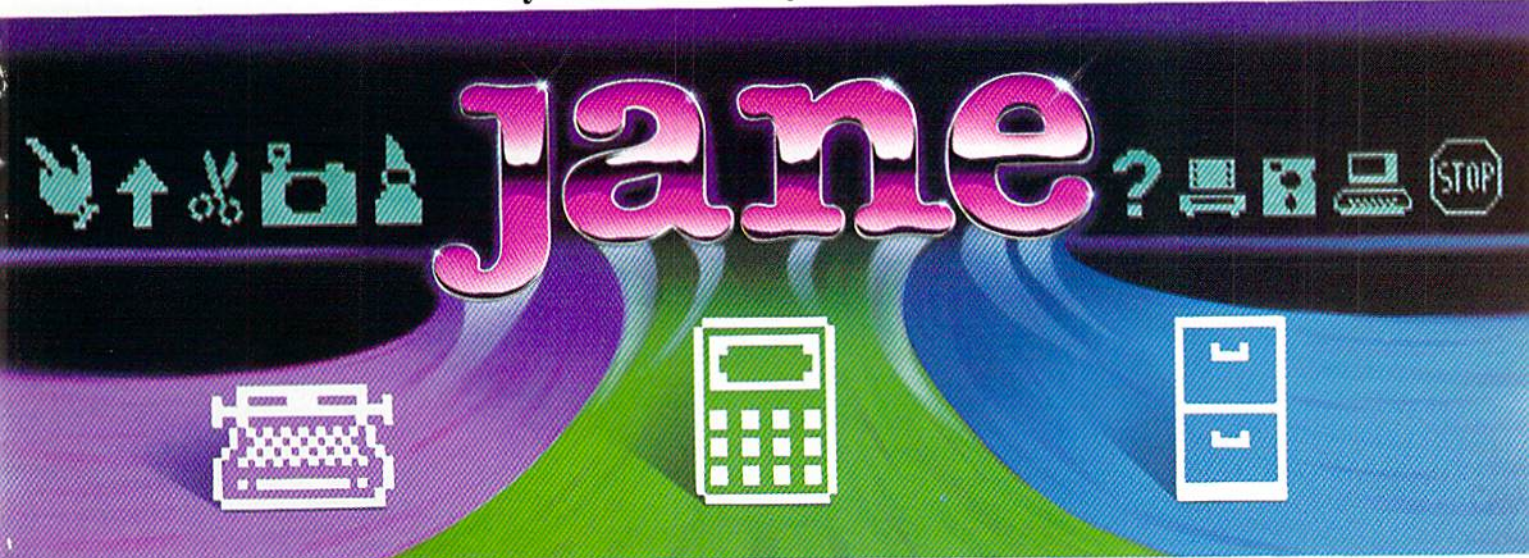
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We found the printer which has all the features anyone could want. We've introduced it as the Arotek Daisy 1120, a real heavy-duty workhorse printing at 20 characters per second. The manufacturer is Olympic Co. Ltd., a highly respected Japanese firm.

FEATURES GALORE

This printer has it all. To start with, it has a front control panel with indicators for Pitch Selection which allows for 10, 12, or 15 characters per inch (CPI) or Proportional Spacing. There is a Select (Online) button (with indicator) and a Line Feed button. You can also set Top-of-Form or Form Feed with the touch of the TOF button. Other front panel indicators include Power and Alarm.

To load a sheet of paper, simply place it in the feed slot and pull the paper bail lever. The paper feeds automatically to a 1 inch top margin and the carriage aligns to the selected left margin. In this manner, each page will have identical margins.

You can also continue to use your computer while the Daisy 1120 is printing.

The built in 2K buffer allows a page or two of concurrent printing and use of your computer for the next job. To really take advantage of your printer's optional features, the automatic Cut Sheet Feeder eliminates tiresome paper handling. Also available is the adjustable Tractor Feed option. *Compare our option prices!*

Best of all the Daisy 1120 is quiet: only 58 dB-A (compare with an average of 62-65 dB-A for others).

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The Daisy 1120 uses Diablo® compatible printwheels. You can pop in a 10, 12, 15 pitch or proportional printwheel and use paper as wide as 13 1/4". At 15 CPI you can print 165 columns—a must for spreadsheets.

The Daisy 1120 uses the Diablo Hytype II® standard ribbon cartridges. Again universally available.

Not only is the hardware completely compatible, the control codes recognized by the Daisy 1120 are Diablo 630® compatible (industry standard). You can take advantage of all the great features of word processing packages and automatically use superscripts, subscripts, automatic underlining, bold-face (shadow printing) and doublestrike.

The printer has a set of rear switches which allow the use of standard ASCII as well as foreign character printwheels. Page length can be set to 8, 11, 12, or 15". The Daisy 1120 can also be switched to add automatic line feed if required.

THE BEST PART

When pricing a daisy wheel printer with all these features (if you could find

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